

Research on the Physical Health Status and Promotion Strategies of Middle School Students in A City in Shandong Province

Keqiang Su^{1*}, Sumei Hu²

¹College of Physical Education, Taishan University, Tai'an, China

²College of Marxism, Taishan University, Tai'an, China

**Author to whom correspondence should be addressed.*

Copyright: © 2025 Author(s). This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY 4.0), permitting distribution and reproduction in any medium, provided the original work is cited.

Abstract: This article uses research methods such as literature review, questionnaire survey, interview, and mathematical statistics to investigate and analyze the physical health status of junior high school students in a city area of Shandong Province. The research results indicate that factors affecting the physical health of middle school students include irregular lifestyle habits, insufficient rest and exercise time, high academic pressure, a family environment not valuing physical exercise, and inadequate school sports equipment and facilities. In response to these influencing factors, strategies are proposed to develop personalized physical education teaching to cultivate students' interest in sports, adopt a reasonable layered teaching model, strengthen and improve the construction of school sports equipment and facilities, promote the improvement of students' physical health through the linkage between schools and families, and create a strong campus sports and exercise atmosphere through multiple measures, aiming to improve the physical health level and promote the physical health development of middle school students.

Keywords: Middle school students; Physical health; Present situation; Promotion strategy

Online publication: October 30, 2025

1. Introduction

The national physical fitness level is the core resource for the future development of a country, especially the physical health of young people, which is the foundation guarantee for the vigorous vitality of the nation. The strong physical fitness and willpower of young people are also a reflection of the improvement of social and demographic quality to a certain extent. The physical health of primary and secondary school students is not only related to their individual development, but also to the overall effectiveness of school sports work. The physical education work in schools has always been strictly arranged and practiced around the core requirement of improving students' physical health level^[1]. Currently, middle school students generally suffer from problems such as insufficient exercise, increasing obesity rates, and declining physical fitness, and their physical health

status is not optimistic. So, changing the concept of physical education for middle school students and paying attention to their physical and mental health has become an important direction of physical education. In this social context, it is necessary for us to comprehensively understand the actual situation of the physical health of middle school students, analyze the main factors affecting their physical health, explore effective strategies and methods to improve their physical health level, and make positive contributions to promoting their healthy development and social progress.

2. Research objects and methods

2.1. Research object

The study focuses on the physical health status and promotion strategies of junior high school students in a city area of Shandong Province.

2.2. Research methods

2.2.1. Literature review method

By conducting a comprehensive review of a large number of journal articles in data resource databases such as China National Knowledge Infrastructure, and according to the needs of the research project, the literature was sorted and summarized to provide sufficient theoretical support for this article. In addition, relevant sports policy documents and annual reports on school sports work were consulted to comprehensively grasp the research status and policy direction.

2.2.2. Questionnaire survey method

According to the research needs, a total of 220 questionnaires were distributed to students in the urban area of a certain city based on their actual situation. 200 questionnaires were actually collected, with 200 valid questionnaires and an effective response rate of 87.00%. 100 questionnaires were distributed to parents of students, and 100 were collected, with an effective response rate of 100%.

2.2.3. Interview method

According to the needs of the research content, we visited some teachers and students from a middle school in the urban area of a certain city, and gained a clear understanding of the current situation of students' participation in physical exercise. Interview samples are extracted from teachers based on dimensions such as grade level. Extract students based on grade, gender, physical education performance, etc., to ensure that the sample is representative.

2.2.4. Mathematical and statistical methods

This study conducted statistical tests on the collected data using Excel spreadsheets to ensure the quality and usability of the data. Finally, conclusions were drawn based on the results of mathematical statistics.

3. Research results and analysis

3.1. Analysis of the physical health status of middle school students in a certain city's urban area

In 2024, a total of 1200 students were sampled for physical fitness testing in the first, second, and third year of junior high school in a city area of Shandong Province, including 713 boys and 487 girls (**Table 1**).

Table 1. Statistics of sample size of junior high school students in a certain city's urban area

Grade	Gender	Number
One year of junior middle school	Boy student	236
	Girl student	164
The second year of junior middle school	Boy student	241
	Girl student	157
The third year of junior middle school	Boy student	236
	Girl student	166

3.1.1. Current physical condition

3.1.1.1. Analysis of height and weight physical test results

Table 2. Statistics of height and weight status of middle school students in urban areas of a certain city ($n = 1200$)

Grade	Gender	Height (cm)	Weight (kg)
One year of junior middle school	Boy student	153.0 ± 8.5	53.18 ± 13.50
	Girl student	155.0 ± 5.2	49.52 ± 10.52
The second year of junior middle school	Boy student	166.0 ± 7.7	71.61 ± 13.70
	Girl student	163.0 ± 5.1	52.12 ± 10.32
The third Year of junior middle school	Boy student	170.0 ± 6.3	75.37 ± 10.88
	Girl student	165.0 ± 4.4	55.32 ± 12.37

From **Table 2**, it can be seen that the height data of students in grades one to three show a gradual increase. The height of students in grade one is significantly lower than that of students in grade three, and the difference is quite significant. The weight data of the three grades in junior high school show a step-like growth pattern. After entering grade two, the weight of male students in grade one increases significantly, with an increase of 18.42 kilograms, while the height growth value of male students in the corresponding period is 13 centimeters.

3.1.1.2. Proportion of BMI index among middle school students in urban areas of a certain city

BMI value, also known as body mass index, is an internationally recognized benchmark for measuring body shape and weight, and is also one of the common criteria for judging health level. $BMI = \text{weight}/\text{height}^2$. According to the national standard for physical health testing requirements, the normal weight distribution of first-year male students is in the range of 15.5–22.1, and a BMI value ≤ 15.4 belongs to the category of light weight. If the BMI falls in the range of 22.2–24.9, it is judged as overweight, and 25 is the BMI threshold for obesity. In the second stage of junior high school, the normal BMI value for male students is within the range of 15.7–22.5. If the BMI value does not exceed 15.6, it belongs to the category of light weight. If the BMI is ≥ 22.6 but does not reach 25.2, it is judged as overweight. If the BMI value exceeds 25.3, it is judged as obesity. The standard weight range for junior high school boys is 15.8 to 22.8, with a BMI value not exceeding 15.7 belonging to the category of light weight. A BMI value between 22.9–26.0 is considered overweight, while a BMI value exceeding 26.1 is defined as obesity. According to medical standards, the normal weight range for girls in their first year of junior high school is 14.8–21.7 BMI values. The critical BMI value for light weight is ≤ 14.7 . When

the BMI value is between 21.8 and 24.4, it is considered overweight. If the BMI exceeds 24.5, it is considered obese. The normal BMI threshold for second-grade girls in junior high school is 15.3–22.2. A BMI value ≤ 15.2 belongs to the category of light weight, while a BMI value exceeding 22.3 but not reaching 24.8 belongs to overweight. If the BMI value is higher than 24.89, it belongs to the category of obesity. The ideal weight distribution for girls in the third year of junior high school is between 16.0–22.6. Individuals with a BMI ≤ 15.9 are classified as underweight. If the BMI value falls within the range of 22.7–25.1, it is considered overweight. If the BMI value exceeds 25.2, it can be diagnosed as obesity ^[2].

Table 3. The current proportion of BMI index among middle school students in urban areas of a certain city ($n = 1200$)

Grade	Gender	Low eight	Standard weight	Overweight	Obesity
One year of junior middle school	Boy	7.8%	70.0%	11.3%	10.9%
	Girl	6.6%	72.9%	11.6%	8.9%
The second year of junior middle school	Boy	7.4%	73.8%	9.9%	8.9%
	Girl	6.9%	75.6%	10.5%	7.0%
The third year of junior middle school	Boy	7.1%	76.2%	9.3%	7.4%
	Girl	8.5%	77.4%	7.2%	6.9%

According to **Table 3**, the proportion of BMI index among middle school students in the urban area of a certain city is gradually increasing, indicating that the number of people with standard body weight is increasing year by year; However, the number of students with low weight, overweight, or obesity still accounts for a large proportion, which means that the development ratio of height and weight is not balanced. The proportion of girls with low body weight increases with age, with proportions of 6.6%, 6.9%, and 8.5%, respectively. This indicates that middle school girls generally have an aesthetic tendency to pursue slimness. The proportion of overweight and obesity among males in this middle school is decreasing, accounting for 22.2%, 18.8%, and 16.7% respectively. However, the phenomenon of weight imbalance (underweight/overweight) is still significant, and the height-to-weight ratio is imbalanced, which is not conducive to promoting physical health.

3.1.2. Current status of physical fitness compliance rate

Analyze the current status of students' physical fitness (speed, endurance, strength, flexibility) by referring to the physical examination form data of middle schools in a certain city area.

Table 4. Physical fitness status of middle school students in a certain city's urban area ($n = 1200$)

Test project	Number of people meeting the standard	Compliance rate
50-meter run	905	75.4%
800-meter run	364	74.7%
1000-meter run	518	72.7%
Pull up (male)	418	58.6%
Sit ups (female)	352	72.3%
Sit and reach	936	78.0%

From the data in **Table 4**, it can be seen that the compliance rate for 50 meter running is 75.4%, 800 meter running is 74.7%, 1000 meter running is 72.7%, sit ups (for girls) is 72.3%, and sitting forward bending is the highest (78%), indicating that students perform well in overall physical flexibility; The lowest success rate (58.6%) for pull up (boys) indicates that their upper limb strength may be relatively weak. There are significant differences in the compliance rates of different projects.

3.1.3. Analysis of the current status of physical function compliance rate

According to the lung capacity standard for middle school students' physical fitness testing, the minimum reference value for lung capacity for male students in Grade 7 is about 2500 milliliters; The minimum for girls is about 2200 milliliters. The minimum lung capacity for boys in the second year of junior high school is about 2700 milliliters, and for girls it is about 2400 milliliters. The minimum lung capacity for boys in the third year of junior high school is about 2900 milliliters, and for girls it is about 2600 milliliters.

Table 5. Statistics of lung capacity compliance rate among middle school students in urban areas of a certain city ($n = 1200$)

Indicator	Grade	Gender	Proportion of compliance
Vital capacity	One year of junior middle school	Boy	81.2%
		Girl	77.8%
	The second year of junior middle school	Boy	83%
		Girl	81.5%
	The third year of junior middle school	Boy	88.2%
		Girl	84%

According to **Table 5**, the compliance rate for male students in Grade 1 is 81.2%, while for female students it is 77.8%. The compliance rate for male students in Grade 2 is 83%, while for female students it is 81.5%. The compliance rate for male students in Grade 3 is 88.2%, while for female students it is 84%. The number of students who meet the lung capacity standards in Grade 1, Grade 2, and Grade 3 has shown an increasing trend, with significant differences between males and females.

3.2. Analysis of factors affecting the physical health of middle school students in a certain city's urban area

3.2.1. The impact of lifestyle habits on physical health

Table 6. Current sleep time status of middle school students in urban areas of a certain city ($n = 200$)

Sleep duration	Number of people	Proportion
9 hours or more	42	21%
7–8 hours	63	31.5%
Less than 7 hours	95	47.5%

According to relevant national regulations, the “Notice on Further Strengthening Sleep Management for Primary and Secondary School Students” clearly states that middle school students should ensure a sleep time

of 9 hours, aiming to promote their physical and mental health development. According to **Table 6**, only 21% of students are able to maintain sufficient sleep. For middle school students, insufficient sleep can lead to difficulty concentrating, decreased physical fitness, weakened immunity, and susceptibility to various diseases.

Table 7. Current situation of dietary habits of middle school students in urban areas of a certain city ($n = 200$)

Unhealthy eating frequency	Number of people	Proportion
0–1 time	53	26.50%
2–3 time	85	42.5%
4 times or more	62	31%

According to **Table 7**, 26.5% of students eat junk food 0-1 times a week, 42.5% eat junk food 2-3 times a week, and 31.0% eat junk food 4 times or more per week. Most students do not pay attention to their dietary health and habits, and irregular and unhealthy eating habits can affect physical development and recovery.

3.2.2. The impact of physical exercise time on physical health

Table 8. Current situation of daily physical exercise time for middle school students in urban areas of a certain city ($n = 200$)

Daily participation in physical exercise time	Number of people	Proportion
1 hour or less	54	27.0%
0.5–1 hour	78	39.0%
Less than 0.5 hours	75	34.0%

From **Table 8**, it can be seen that the survey shows that 27.0% of students exercise for less than 1 hour per day, and 39% of students exercise for more than half an hour or less per day. The survey shows that 34% of students exercise for less than half an hour per day, and the majority of students exercise for less than 1 hour per day. Moreover, students' physical exercise mainly relies on physical education classes, which are squeezed into the teaching system, resulting in insufficient physical exercise and reduced student motivation.

3.2.3. The impact of family environmental factors on physical health

Table 9. Current status of parents' attention to physical exercise among middle school students in a city's urban area ($n = 100$)

Parents' attention to physical exercise	Number of people	Proportion
Very concerned	21	21.0%
pay more attention to	33	33.0%
Not paying much attention	46	46.0%

From **Table 9**, it can be seen that 21.0% of parents are very concerned about their children's physical exercise, 33% of parents are relatively concerned about their children's physical exercise, 46% of parents are not

very concerned about their children's physical exercise, and the majority of parents do not attach importance to their children's physical exercise in the family environment. Some parents focus too much on learning and underestimate the concept of sports. In addition, the family sports atmosphere is not strong, and they do not provide sufficient support for their children, which is not conducive to the healthy development of their physical fitness.

Table 10. Current status of parents' attention to academic performance and physical exercise of middle school students in urban areas of a certain city ($n = 100$)

Parents attach importance to certain aspects	Number of people	Proportion
Academic performance is important	49	49.0%
Physical exercise is important	16	16.0%
Both are equally important	35	35.0%

From **Table 10**, it can be seen that 49% of parents believe that academic performance is important, 16% of parents believe that physical exercise is important, and 35% of parents believe that both are equally important. Parents do not attach enough importance to physical exercise, and their emphasis on learning over physical activity is evident.

Table 11. Attitude of parents of middle school students in urban areas of a certain city towards supporting extracurricular physical exercise ($n = 100$)

Supporting attitude	Number of people	Proportion
Very supportive	26	26.0%
Relatively supportive	41	41.0%
Never mind	29	29.0%
Not supported	4	4.0%

From **Table 11**, it can be seen that 26% of parents strongly support the school's frequent extracurricular sports activities, 41% of parents are relatively supportive of the school's frequent extracurricular sports activities, 29% of parents have an indifferent attitude towards the school's frequent extracurricular sports activities, and 4% of parents do not support the school's frequent extracurricular sports activities, indicating that 33% of parents do not attach importance to students' participation in extracurricular sports exercises.

3.2.4. The impact of weekly participation in extracurricular physical exercise time on physical health

Table 12. Survey on the current situation of weekly extracurricular sports exercise time for middle school students in urban areas of a certain city ($n = 200$)

Weekly participation in extracurricular exercise time	Number of people	Proportion
3 hours or more	67	33.5%
About 1–2 hours	98	49%
Almost no participation	35	17.5%

According to **Table 12**, 33.5% of students participate in extracurricular exercise for 3 hours or more per week, 49% participate in extracurricular exercise for 1–2 hours per week, and 17.5% hardly participate in extracurricular exercise per week. Students' outdoor activities have decreased and sedentary time has increased, which is not conducive to improving their physical health.

3.2.5. The impact of excessive academic pressure on physical health

Table 13. Current status of academic pressure sources for middle school students in urban areas of a certain city ($n = 200$)

Sources of academic pressure	Number of people	Proportion
Academic examination	62	31.0%
Homework burden	92	46.0%
Extracurricular tutoring classes	46	23.0%

According to **Table 13**, 38.0% of students' academic pressure comes from academic exams, 38.5% comes from homework burden, and 23.5% comes from extracurricular tutoring classes. A large amount of homework and exams occupies students' spare time, leaving them with no time to participate in exercise. Long-term stress can also affect their physical and mental health.

3.2.6. The impact of school sports venues, equipment and facilities on physical health

Table 14. Survey on the current status of sports equipment in middle schools in urban areas of a certain city ($n = 200$)

Adequate sports equipment	Number of people	Proportion
Very sufficient	34	17.0%
Basically sufficient	89	44.5%
Insufficient	77	38.5%

According to **Table 14**, 17% of students reported that sports equipment is very sufficient, 44.5% reported that sports equipment is basically sufficient, and 38.5% reported that sports equipment is insufficient. This indicates that sports equipment and facilities cannot meet the needs of students to engage in sports activities, which is not conducive to improving their physical health.

3.3. Strategies for promoting middle school students' physical health in a certain city's urban area

3.3.1. Developing personalized physical education teaching to cultivate students' interest in sports

Implement differentiated physical education teaching activities based on students' differences in physical characteristics, physical foundation, interest focus, and sports expertise. Physical education teaching should establish an educational model based on motivation, affirmation, and rewards. In the face of students' skill progress, positive affirmation should be given quickly to cultivate their confidence in physical exercise and

stimulate their initiative to continue participating. Sports games, innovative competition activities, or novel forms of activities can be used to stimulate students' initiative and enthusiasm for participating in classroom physical exercise^[3]. For students with poor physical fitness, basic physical fitness improvement courses are set up, focusing on training strength, endurance, and flexibility.

3.3.2. Reasonable use of the layered teaching mode

According to students' physical fitness test scores and athletic abilities, they are divided into different levels for teaching. For students with good physical foundation and strong athletic abilities, higher difficulty training content and competition opportunities are provided to help them develop their sports talents; For students with average physical fitness, set moderate intensity teaching goals and training programs to gradually improve their physical level. For students with poor physical fitness, the focus is on carrying out basic physical training, emphasizing the cultivation of their exercise habits and interests. During the teaching period, the stratification is adjusted promptly based on the students' performance to ensure the pertinence and effectiveness of the teaching.

3.3.3. Further improve the construction of sports equipment and facilities

Schools can use various methods to improve and enrich sports facilities, promote students' physical fitness level, plan venues appropriately according to students' age and sports needs, build diversified sports venues such as basketball courts and badminton courts, meet the needs of different sports projects, inspect and maintain existing facilities on time, repair damaged equipment promptly, and ensure safety during use; At the same time, intelligent fitness equipment such as smart skipping rope counting devices will be introduced to stimulate students' enthusiasm for sports. A small sports corner will be built based on the open space at the corner of the campus, adding interesting sports facilities. Cooperation can also be reached with communities and sports venues to increase the space for students to exercise, allowing students to have more opportunities to participate in physical exercise and improve their overall health level.

3.3.4. School family linkage promotes students' physical health improvement

Strengthen communication and cooperation between schools and families, and form a physical education model that links families and schools. The school held a parent symposium as planned to explain the dual benefits of physical exercise on students' physical and psychological health, promote parents' awareness of cultivating their children's exercise habits, set an example, develop regular exercise habits, and create a positive family sports environment for their children. Parents should reasonably allocate their children's after-school time, supervise their children to engage in physical exercise, and maintain close contact with the school to timely understand their children's physical performance in school, jointly promoting their children's physical health development.

3.3.5. Multiple measures taken to create a strong campus sports exercise atmosphere

Schools should increase their promotion of sports culture through various channels such as campus broadcasting, bulletin boards, and school newspapers to publicize the benefits of physical exercise, inspirational anecdotes of sports stars, and to arouse students' enthusiasm for sports. They should set up sports cultural landscapes on campus, such as statues of sports celebrities and sports slogans, to create a strong sports cultural atmosphere. Schools can also encourage teachers to participate in sports activities, highlight the exemplary value of teachers, and drive students to actively engage in sports exercise.

4. Conclusion and suggestions

4.1. Conclusion

- (1) Uneven development of students' physical fitness, significant changes in body shape, and a significant increase in obesity rates among male students. Insufficient sleep time, unhealthy eating habits, excessive academic pressure, lack of emphasis on sports in the family environment, and lack of sports equipment are not conducive to promoting physical health among students.
- (2) In terms of family environment, parents' emphasis on learning and neglect of physical education, as well as poor family sports atmosphere, are not conducive to the healthy development of children's physical fitness; At the school level, physical education classes are under pressure, with insufficient exercise time, single methods, and insufficient sports equipment, which limits the development of students' physical activities; On an individual level, students lack interest in sports and have poor self-discipline, resulting in insufficient active exercise; Long term sitting, limited extracurricular exercise time, and high academic pressure all hinder the improvement of students' physical health to varying degrees.
- (3) Propose strategies to promote the physical health of middle school students: develop personalized physical education teaching to cultivate students' interest in sports, adopt a reasonable hierarchical teaching mode, further improve the construction of sports equipment and facilities, promote the improvement of students' physical health through school family linkage, and take multiple measures to create a strong campus sports exercise atmosphere.

4.2. Suggestions

- (1) Optimize the physical education curriculum and enrich the forms of sports activities. Develop personalized physical education courses based on students' age, gender, and physical fitness differences. Add fun and challenging projects, conduct layered teaching based on students' physical fitness and sports skills, provide opportunities for expansion training and competition for students with strong abilities, and encourage young students to actively take action, step out of the classroom, and step into the sunshine, fully demonstrating the healthy and upward spirit of young people in the new era. ^[4] At the same time, personalized dietary and exercise intervention plans should be developed for students who are overweight, obese, and malnourished. While guiding students to exercise scientifically and reasonably, it is also necessary to guide them to have a healthy diet. For obese individuals, it is recommended to eat as little high-calorie food as possible ^[5].
- (2) Emphasize physical exercise and create a family sports environment. The progress of students' physical health cannot be achieved without the active participation of their families. The growth process and daily life of students are centered around the family. Parents need to correctly grasp the significance of adolescent physical health, provide sufficient support to their children, create a supportive family environment, encourage children to engage in sports practice, and enhance their physical function ^[6]. Parents should establish a correct educational concept, recognize the importance of physical exercise for children's physical and mental health, and arrange their children's diet and daily life reasonably, establish a reasonable and balanced dietary structure, so that their children can develop good eating habits and ensure sufficient sleep. These are all necessary conditions for healthy human growth ^[7].
- (3) Strengthening publicity guidance and providing sports resource support should increase the publicity intensity of knowledge related to the physical health of young people, to enhance public awareness of physical health, achieve a dual harvest of physiological and psychological health, and combine

entertainment and diverse leisure sports to attract more people, breaking through the rigid view of sports in the past and realizing the synergistic effect of entertainment and fitness ^[8]. Organize various sports activities, encourage young people to participate, and create an atmosphere where the whole society values sports.

Disclosure statement

The authors declare no conflict of interest.

References

- [1] Gu F, 2022, Strategies for Effectively Improving Students' Physical Fitness in Primary and Secondary School Physical Education Teaching. *Xue yuan*, 15(16): 26–28.
- [2] Liao A, 2023, Research on the Physical Health Status and Improvement Strategies of Junior High School Students in Guangning County, thesis, Guangzhou Sport University.
- [3] Wang X, Li Z, 2024, Research on the Optimization Path of Promoting Physical Health of Middle School Students. *Proceedings of the 13th China Physical Training Science Conference (Part 1)*, 2024: 145–147.
- [4] Cao C, 2014, Investigation and Analysis of the Physical Health Status of Middle School Students. *New Curriculum Research (Next Issue)*, 2014(06): 26–27.
- [5] He X, 2018, Research on Effective Intervention Strategies for Physical Health of Junior High School Students. *Contemporary Sports Technology*, 8(30): 18–19.
- [6] Jiang W, Li N, 2021, Research on the Influencing Factors and Strategies of Middle School Students' Physical Health Under the Background of Healthy China. *Sports Perspective*, 2021(12): 65–66.
- [7] Xie J, 2018, Research on School Physical Education Work Based on Enhancing the Physical Fitness of Adolescents. *Sports Culture Guide*, 2018(08): 124–129.
- [8] Huang J, Li B, 2020, Analysis of Strategies for Promoting Adolescent Physical Health. *Sports Boutique*, 39(10): 53–54 + 56.

Publisher's note

Bio-Byword Scientific Publishing remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.