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## Comparative Analysis of Abnormal Physical Fitness Index among Students in Taizhou City from 2019 to 2020

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**Abstract** Objective: To compare and analyze the abnormal physical fitness index of primary and secondary school students in Taizhou City in 2019 and 2020, in order to understand the incidence of overweight, obesity, and low weight among primary and secondary school students in Taizhou City in 2019 and 2020, and to provide theoretical reference for improving the physical health level of primary and secondary school students in Taizhou City. Method: This article adopts the methods of literature review, mathematical statistics, and comparative analysis to compare and analyze the changes in the physical abnormality index of primary and secondary school students in Taizhou City in 2019 and 2020. Conclusion: In 2019 and 2020, the average physical fitness index of primary and secondary school students in Taizhou City was within the normal range; The average physical fitness index of each academic stage in 2020 has increased compared to the average in 2019, and the increase is higher for boys than girls in all academic stages. Compared with 2019, the normal weight and low weight rates of students in 2020 have decreased overall, while the obesity and overweight rates have increased.

**Keywords** Physical fitness index; Primary and secondary school students; Obesity rate; Overweight rate; Low body weight rate

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### 1. Introduction

The physical health level of students affects the healthy growth of the younger generation, and the physical health of students directly affects the quality of talent cultivation in China. With the development of China's economy, the quality of life and nutritional level of the people are constantly improving, and student health issues are also attracting widespread attention from all sectors of society. The continuous decline in the physical health level of students has attracted high attention from the Party Central Committee. In May 2007, the Central Committee of the Communist Party of China issued 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". In 2021, the State Council forwarded the "Several Opinions on Further Strengthening School Physical Education" jointly developed by the Ministry of Education, the Development and Reform Commission, the Ministry of Finance, and the General Administration of Sport, all of which are intervening in the physical health of students through government leadership, thereby continuously improving their physical health level. In recent years, the overall trend of abnormal weight such as overweight and obesity rates among primary and secondary school students have been on the rise, and has become one of the main factors endangering the health of adolescents. This article compares and analyzes the abnormal physical fitness index of primary and secondary school students in Taizhou City in 2019 and 2020, in order to understand the incidence of overweight, obesity, and other abnormal weight among primary and secondary school students in Taizhou City in 2019 and 2020, and



provide theoretical reference for improving the physical health level of primary and secondary school students in Taizhou City.

## 2 Methods and Objects

### 2.1 Objects

Abnormal physical fitness index of primary and secondary school students in Taizhou City in 2019 and 2020. The Body Mass Index (BMI) is calculated as weight (kg)/height<sup>2</sup> (m<sup>2</sup>). Abnormal physical fitness index refers to overweight, obesity, and low body weight in addition to normal weight.

### 2.2 Methods

#### 2.2.1 Literature review method

Through searching and analyzing well-known domestic paper websites such as CNKI and Wan Fang, more than 30 articles were retrieved using the keyword "physical fitness index"; Viewing reports and other related materials on Baidu, selecting from them, provides a reference basis for the writing of this paper.

#### 2.2.2 Mathematical Statistics

The relevant data for this study comes from the Taizhou City Center for Promoting Physical Fitness and Health Research of Primary and Secondary School Students (affiliated with the School of Physical Education and Health Education, Taizhou College, Nanjing Normal University). Use Excel to perform mean and percentage statistics on the obtained data, and create corresponding statistical tables.

#### 2.2.3 Comparative analysis ratio

Compare and analyze relevant statistical data based on years and urban and rural areas.

## 3 Results

### 3.1 Overall comparison of weight distribution among primary and secondary school students in Taizhou City in 2019 and 2020

According to the overall weight distribution statistics of primary and secondary school students in Taizhou City in 2019 and 2020 (Table 2), compared with the BMI level in Taizhou City in 2019, the normal weight rate decreased by 13.5 percentage points, the obesity rate increased by 9.4 percentage points, the overweight rate increased by 6.1 percentage points, and the low weight rate decreased by 1.9 percentage points in 2020.

The gender distribution of weight among primary and secondary school students in Taizhou City shows that the normal weight rate and low weight rate of male students in Taizhou City in 2020 were 16.5 percentage points and 1.7 percentage points lower than those in Taizhou City in 2019, respectively; The overweight rate and obesity rate were 6.1 and 12.1 percentage points higher than those in Taizhou City in 2019, respectively. The normal weight rate and low weight rate of female students were 10.6 percentage points and 1.8 percentage points lower than those in Taizhou City in 2019, respectively. The overweight rate and obesity rate were 6.1 percentage points and 6.5 percentage points higher than those in Taizhou City in 2019, respectively.

**Table 1:** Comparison of Overall Distribution of Different Weights among Primary and Secondary School Students in Taizhou City in 2019 and 2020

BMI level	Male		Female		Total	
	2019 (%)	2020(%)	2019(%)	2020(%)	2019(%)	2020(%)
Normal body weight rate	69.1	52.6	76.6	66	72.8	59.3
Overweight rate	18.5	24.6	12.2	18.3	15.3	21.4
Obesity rate	8	20.1	5.5	12	6.7	16.1
Low body weight rate	4.4	2.7	5.8	3.7	5.1	3.2

### 3.2 Comparison of obesity rates among students of different academic stages in Taizhou City in 2019 and 2020

Currently, global childhood obesity is on the rise, and the WHO has established the "Committee to End Childhood Obesity" and released the "Report on Ending Childhood Obesity" in 2016. According to the "Report on Nutrition and Chronic Disease Status of Chinese Residents (2020)", the overweight and obesity rate among children and adolescents aged 6 to 17 is close to 20%, and overweight and obesity have become the main factor threatening the physical and mental health of children and adolescents in China.



According to the Chinese Obesity Working Group (WGOC) Children and Adolescents Body Mass Index standard, statistical analysis was conducted on the obesity rates of primary and secondary school students in Taizhou City in 2019 and 2020. The results showed (Table 3) that the overall obesity rates of primary and secondary school students in Taizhou City showed a trend of decreasing with age; Meanwhile, in both years, the obesity rates for both males and females were highest in primary school, with males being higher than females in all academic stages.

Compared with Taizhou City in 2019, the average obesity rate between the ages of 7 and 17 in Taizhou City in 2020 increased by 12.2 and 6.8 percentage points for males and females, respectively; In each academic stage, the obesity rates of male and female students in primary school in Taizhou City increased by 13.2 and 6.9 percentage points respectively in 2020, while the obesity rates of male and female students in middle school increased by 11.1 and 7.3 percentage points respectively; The obesity rates of males and females in high school increased by 11.2 and 6.0 percentage points respectively.

**Table 2:** Comparison of obesity rates among students of different academic stages in Taizhou City in 2019 and 2020 (%)

Age	Male			Female		
	2019	2020	D-value	2019	2020	D-value
7	12.7	24.0	-11.3	8.6	18.5	-9.9
8	13.5	26.4	-12.9	11.1	15.3	-4.2
9	10.7	28.5	-17.8	7.0	15.3	-8.3
10	12.3	24.6	-12.3	7.7	12.7	-5.0
11	12.3	24.2	-11.9	7.8	14.7	-6.9
Average age of 7-11 years old	12.3	25.5	-13.2	8.4	15.3	-6.9
12	11.8	22.4	-10.6	8.6	13.3	-4.7
13	6.4	22.0	-15.6	4.3	15.5	-11.2
14	8.3	15.4	-7.1	3.6	9.8	-6.2
Average age of 12-14 years old	8.8	19.9	-11.1	5.5	12.8	-7.3
15	4.0	17.5	-13.5	3.3	10.1	-6.8
16	3.9	14.7	-10.8	3.2	9.3	-6.1
17	3.5	12.9	-9.4	2.3	7.6	-5.3
Average age of 15-17 years old	3.8	15.0	-11.2	3.0	9.0	-6.0
Average age of 7-17 years old	9.0	21.2	-12.2	6.1	12.9	-6.8

### 3.3 Comparison of overweight rates among students of different academic stages in Taizhou City in 2019 and 2020

Overweight is an important manifestation of abnormal weight, and without intervention, it is bound to eventually develop into obesity. In China, the overweight rate of children and adolescents aged 6-17 is 11.1%, and the overweight rate of children under 6 years old is 6.8%. Overweight has a serious impact on the physical and mental health of young students in China.

According to the statistical analysis of the overweight situation of students in various academic stages in Taizhou City in 2019 and 2020 (Table 5), the overweight rate of male students in each academic stage was higher than that of female students in the same academic stage in both years. Compared with 2019 in Taizhou City, the average overweight rate between the ages of 7 and 17 in 2020 increased by 12.2 and 6.8 percentage points for males and females, respectively; In each academic stage, male and female students in primary school increased by 3.2 and 3.9 percentage points respectively, while in middle school, male and female students increased by 2.8 and 4.9 percentage points respectively; In high school, both male and female students increased by 8.8 and 8.5 percentage points respectively.



**Table 3:** Comparison of overweight rates (%) of students in different academic stages in Taizhou City between 2019 and 2020

Age	Male			Female		
	2019	2020	D-value	2019	2020	D-value
7	15.5	16.9	-1.4	13.2	13.7	-0.5
8	15	21.9	-6.9	9.9	13.5	-3.6
9	16.7	18.4	-1.7	11	16.3	-5.3
10	20.6	26.4	-5.8	10	16.1	-6.1
11	25.5	26.2	-0.7	11.8	15.7	-3.9
Average age of 7-11 years old	18.7	21.9	-3.2	11.2	15.1	-3.9
12	24.2	26.5	-2.3	16.7	19	-2.3
13	23.5	21.5	2	14.3	19.2	-4.9
14	16.3	24.2	-7.9	12.1	19.5	-7.4
Average age of 12-14 years old	21.3	24.1	-2.8	14.3	19.2	-4.9
15	15.3	22.8	-7.5	10.7	18.8	-8.1
16	15.6	26	-10.4	11.1	21.4	-10.3
17	18.3	26.6	-8.3	13	20.2	-7.2
Average age of 15-17 years old	16.4	25.2	-8.8	11.6	20.1	-8.5
Average age of 7-17 years old	18.8	23.4	-4.6	12.2	17.6	-5.4

### 3.4 Comparison of Low Weight Rates among Students of Different Academic Stages in Taizhou City in 2019 and 2020

Low weight is one of the factors that harm the health of adolescent students. Low body weight can easily lead to essential fatty acid deficiency, leading to related diseases such as stunted growth and development in adolescent students.

According to the statistical results of the low weight rate of students aged 7-17 in Taizhou City in 2019 and 2020 (Table 7), the low weight rate of students in each academic stage of Taizhou City in 2020 was lower than that of students in the same academic stage in 2019. Among them, the male and female students in primary school (aged 7-11) have decreased by 1.4 and 1.1 percentage points respectively compared to their peers in 2019; In the junior high school stage (12-14 years old), the number of male and female students decreased by 0.8 and 1.6 percentage points respectively compared to their peers in 2019; In high school (15-17 years old), both male and female students have decreased by 2.6 percentage points and 3.2 percentage points respectively compared to their peers in 2019; Men and women aged 7-17 have decreased by 1.5 and 1.8 percentage points respectively compared to those aged 7-17 in 2019. In today's rapidly developing economy, there is still a certain proportion of low weight among adolescent students, which may be related to the concept of "being thin is beautiful" and irregular eating habits.

**Table 4:** Comparison of Low Weight Rates among Students of Different Age Groups in Taizhou City in 2019 and 2020

Age	Male			Female		
	2019	2020	D-value	2019	2020	D-value
7	7.1	3.2	3.9	8.6	5.3	3.3
8	5	3.4	1.6	7.7	6.5	1.2
9	3.5	3.4	0.1	5.2	3.6	1.6
10	2.1	3.2	-1.1	3.5	3.2	0.3
11	3.5	1	2.5	1.6	2.2	-0.6
Average age of 7-11 years old	4.2	2.8	1.4	5.3	4.2	1.1
12	1.6	2	-0.4	3.1	1.6	1.5
13	2.4	1.7	0.7	3.5	2.6	0.9
14	3.7	1.7	2	4	1.7	2.3
Average age of 12-14 years old	2.6	1.8	0.8	3.5	1.9	1.6
15	4	1.4	2.6	5.1	2	3.1
16	6.1	2.8	3.3	7.8	4.1	3.7
17	5.3	3.4	1.9	7.5	4.7	2.8
Average age of 15-17 years old	5.1	2.5	2.6	6.8	3.6	3.2
Average age of 7-17 years old	4	2.5	1.5	5.2	3.4	1.8



#### 4 Conclusion

**4.1** The average physical fitness index of students in each school age group is within the normal range, and there are differences in years and genders. The average physical fitness index of primary and secondary school students in Taizhou City in 2019 and 2020 was within the normal range; The average physical fitness index of each academic stage in 2020 has increased compared to the average in 2019, and the increase is higher for boys than girls in all academic stages.

**4.2** The incidence of overweight and obesity shows an increasing trend, while normal weight and lower weight show a decreasing trend. Compared with 2019, the normal weight and low weight rates of students in 2020 have decreased overall, while the obesity and overweight rates have increased.

**4.3** The obesity rate generally decreases with age, and there are gender and year differences. The overall obesity rate of primary and secondary school students in Taizhou City shows a trend of gradually decreasing with age, and male students are higher than female students in all academic stages. The obesity rate among students in 2020 showed an increasing trend compared to 2019.

**4.4** There is a gender difference in the overweight rate, which shows an increasing trend over time. The overweight rate of male students in each academic stage in 2019 and 2020 was higher than that of female students in the same academic stage. The overweight rates of male and female students in the three academic stages in 2020 were higher than those in the same academic stage in 2019.

**4.5** The overall trend of low body weight rate is decreasing. The low weight rate of students in various academic stages in Taizhou City in 2020 has decreased compared to students in the same academic stage in 2019.

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