A Comparative Study on the Physical Fitness of Young Women in Hotan Area between 2018 and 2022 —Take the Students of Hotan Normal College as an Example

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Abstract: *This article collects the physical data of 603 female students in Hotan Normal College. According to the items in the physical health test of college students, there are height, weight, vital capacity, 50 meters, standing long jump, sitting forward bend, 800 meters, sit-up and so on. Through the analysis of these data, it is found that 2022 students in speed quality, strength quality, explosive ability, cardiopulmonary ability and endurance projects are better than 2018 students, of which 50 meters faster than 0.4 seconds, standing long jump more than 11 cm, more than 7 percent, one minute sit-ups more than 6, the achievement gap is the most obvious difference of 20 percent. The lung capacity was 126 milliliters higher; And an 800m average 30 seconds faster than the class of 2018 average, a ten per cent improvement.*

Keywords: *Physical quality, Comparison, Sports test, Statistics*

1. Introduction

Physical fitness is the comprehensive performance of the functions of various organ systems in the movement, labor and daily activities of the human body under the regulation of the central nervous system, such as strength, endurance, speed, sensitivity, flexibility and other body abilities. The strength of physical quality is one of the important signs to measure a person's physical condition. The development of physical fitness is of great significance to enhance people's physique and health.The physical health of college students is the common concern of the state and the society question.[1] The Outline of the Healthy China 2030 Plan was put into effect Youth Physical Activity Promotion program to foster youth love of sports, and it is proposed that by 2030, the national students' physical health standards reach the excellent rate reach the target of more than 25%.

This paper has collected the physical test data of a total of 603 people, in line with the attitude of seeking truth from facts, each data is strictly input, the data is strictly analyzed, used to collect, verify, to ensure that the data is confirmed.

2. Research object and method

2.1 Research objects

This paper collected a total of 603 physical test data, all of which were recorded by myself, with reliable data and a realistic attitude, and each data was strictly input. 603 students were from Hotan Normal College, 233 students were from 2018, aged between 18-21, and 370 girls were from 2022.

2.2 Research methods

2.2.1 Literature data method

The "China National Knowledge Network database" extensively consulted, collected and sorted out the domestic college students and physical health related materials, as well as the research literature related to this paper, to provide reference for the research of this topic.

2.2.2 Mathematical statistics method

SPSS Statistics 26.0 was used for data entry and processing, and mean comparison, t test (independent sample t test) and other relevant processing were performed on the obtained physical fitness test data.

2.2.3 Experimental method

According to the items in the physical fitness test of college students, 387 students were tested for height, weight, lung capacity, 50 meters, standing long jump, sitting forward bend, 800 meters, 1000 meters, sit-ups and pull-ups. Among them, the lung capacity, 800 meters reaction is cardiopulmonary function and endurance quality, the standing long jump reaction is explosive quality, 50 meters reaction is speed quality, sit-up reaction is strength quality, sit forward bending reaction is flexibility quality, all the test author personally tested and recorded, collated, so you can ensure the authenticity of the data. The test lasted for two weeks, and the test subjects were informed of the importance of the data before the test, so the test subjects are going all out to reduce the influence of subjective factors as far as possible, so that the test is effective in validity and reliability.

3. Analysis and discussion

Class 2022 girls are Group 2 and class 2018 girls are group 1.

3.1 Height, weight and BMI

3.1.1 Height

Table 1: Height

	Categories	Number of cases	Average	Standard deviation	Mean standard error
Height	1	233	159.339	8.9926	5781.
	2	370	159.530	15.9143	1.3308

Table 1 shows the height data of the two groups of students, Group 1 is the class of 2018, Group 2 is the class of 2022. It can be seen from the table that the average value of Group 1 is 159.29 cm, and the average value of group 2 is 159.530 cm, the difference is 0.1 cm, and there is almost no difference.

3.1.2 Body weight

Table 2 shows the weight data of the two groups of students. It can be seen from the table that the average value of group 1 is 56.11kg, and that of group 2 is 57.19kg, with a difference of one kg. Table 3 is obtained by independent sample T-test for body weight.

Table 2: Body weight group statistics

	Categories	Number of cases	Average	Standard deviation	Mean standard error
Weight	1	233	56.1128	28.58721	1.83387
	2	370	57.1986	14.30506	1.19209

3.1.3 BMI

The calculation formula of BMI: BMI= weight/(height * height). When calculating BMI here, the unit of height needs to be converted into meters, which has been converted in this paper.

Table 3: Independent sample test of body weight

		Levin's test for variance equality		Mean equality T-test				
		F	Salience	t	Degrees of Freedom	Sig. (Double tail)	Difference in mean	Standard error difference
Weight	Assumed equal variance	129.	720.	- 425.	385	671.	1.08585	2.55379
	Equal variance is not assumed			- 496.	376.085	620.	1.08585	2.18727

The formula for calculating BMI: BMI= weight/(height * height). The unit of height needs to be

converted into meters when calculating BMI here, which has been converted when calculating in this paper.

Table 4: BMI group statistics

	Categories	Number of cases	Average	Standard deviation	Mean standard error
BMI	1	233	21.1321	2.81513	18096.
	2	370	21.7925	4.08157	34132.

Table 4 shows the BMI data for groups 1 and 2, in terms of mean. Group 2 is 0.6 larger than group 1.The BMI data suffice to say that there was no significant difference between group 1 and group 2 in this category, and the basic body hardware was the same. The same physical hardware condition is more convincing for the difference in the subsequent analysis of physical fitness.[1]

3.2 50 meters

Table 5: 50 meters group statistics

Groups	Number of cases	Average	Standard deviation	Mean standard error
1	233	9.9638	97789.	06273.
2	370	9.5467	79493.	06671.

Table 5 is the girls' 50m results, from the average point of view, the difference is 0.4 seconds, the students in group 2 50m results are 0.4 seconds faster than the students in group 1, according to the "National Students' Physical health standards" 0.4 seconds is a gap of 4 minutes, 9.54 seconds get 68 minutes, 9.96 seconds get 64 minutes, the gap is still more obvious.

Table 6: Independent sample test of 50m performance

		Levin's test for variance equality		Mean equality T-test					
		F	Salience	t	Degrees of Freedom	Sig. (Double tail)	Mean difference	Standard error difference	Difference 95% confidence interval Lower bound
50 meters	Assumed equal variance	7.189	008.	4.316	383	000.	41710.	09663.	22711.
	Equal variance is not assumed			4.555	343.93	000.	41710.	09157.	23699.

As can be seen from Table 6, the difference and heterogeneity of Levine variance equality test, see if the data of equivariance is not assumed, Sig. (double-tail) value is less than 0.01, that is, P<0.01, which has a very significant difference, indicating that there is a significant difference between the girls of 2018 and 2022 in the sample in 50 meters, which is also confirmed by the difference of 0.417 seconds between the mean. In the course of 50 meters, the time gap of 0.4 seconds will have a gap of 2-3 meters, which is already quite obvious. Combined with the mean value, it can be seen that the average time of 50 meters for students from 2022 is faster than that of students from 2018. 50 meters running reflects the difference between students' reaction speed, speed quality and explosive quality. Because 50 meters has certain requirements for explosive power, it is speculated that the reasons for the faster 50 meters will also be shown in the standing long jump.

3.3 Standing long jump

Table 7: Standing long jump

	Categories	Number of cases	Average	Standard deviation	Mean standard error
Standing long jump	1	233	157.23	15.916	1.021
	2	370	168.08	16.945	1.412

Table 7 shows the mean of the standing long jump of the women's two groups in centimetres, the difference between the two groups is 11cm, and the mean difference is large. The students in group 2 have obviously better standing long jump results, and according to the National Physical Health Standard for college students, standing long jump of 168 cm can get about 72 points. 157 cm can get 64 points, 11

cm difference of nearly 8 points, the gap is obvious. The average standing long jump score of the girls in the class of 2022 is 8cm more than the average standing long jump score of the girls in the class of 2018.[2]

In combination with Table 8, the value of Levin's variance equality test is greater than 0.05, and refer to the P value of homogeneity of variance. It can also be seen from Table 4 that P<0.01 is also a very significant difference, indicating that the difference between group 1 and group 2 in standing long jump is not an individual case, but a significant difference. There are almost all differences in standing long jump results between the samples of group 1 and group 2, which further verifies the difference in explosive power shown in the 50m event.

Table 8: Independent sample test of standing long jump performance

		Levin's test of variance equality		Mean equality T-test			
		F	Salience	t	Degree of freedom	Sig. (Double tail)	Difference in mean	Standard error difference
Standing long jump	Assumed equal variance	104.	747.	6.323	385	000.	10.842	1.715
	Do not assume equal variance			6.222	285.50	000.	10.842	1.743

3.4 Sit-ups

Sit-ups are used to measure a girl's strength quality. Sit-ups mobilize the large muscle groups of the body. "The more sit-ups you do per minute the stronger the abdominal muscles.[3] The strength of the abdominal muscles is strong, which plays a very important role in maintaining a good body posture, protecting internal organs, maintaining the daily activities of the human body. The core strength is usually evaluated by the number of sit-ups in 1 minute.

Table 9: Sit-up performance group statistics

	Categories	Number of cases	Average	Standard deviation	Mean standard error
Sit-ups	1	233	28.29	6.700	431.
	2	370	34.19	6.596	552.

From the statistics in Table 9, it can be seen that in the item of one-minute sit-ups, the average score of group 1 is six less than that of the students in group 2, and 20% more than that of the students in group 1. If the T-test is performed on the data, the predicted P-value will also be less than 0.01, showing a significant difference. According to the "National Students' Physical health Standards" of college students, girls can get 68 points by doing 34 sit-ups per minute, and students in group 2 can get 62 points by doing 28 sit-ups per minute. The difference of 6 points is also close to the difference of lung capacity in Table 10. Relative to the difference of 50 meters and standing long jump, the difference is two points higher and two points lower, and the difference fluctuation is normal.[4]

Table 10: Sit-up performance independent sample test

		Levin test for variance equality		Mean equality T-test			
		F	Salience	t	Degrees of Freedom	Sig. (Double tail)	Difference in mean	Standard error difference
Sit-ups	Assumed equal variance	328.	567.	8.396	383	000.	5.900	703.
	Do not assume equal variance			8.430	301.845	000.	5.900	700.

After the independent sample T-test for sit-ups, it can be seen that it is the same as predicted in the analysis of Table 10.[5] In the case of homogeneity of variance, P<0.01, the result has a significant difference, then it can be considered that the students in Group 2 are better than the students in group 1 in sit-ups, or it can be said that the students in group 2 are better than the students in group 1 in core strength.

3.5 Lung capacity

Table 11: Group statistics

	Categories	Number of cases	Average	Standard deviation	Mean standard error
Lung Capacity	1	233	2639.22	512.419	33.344
	2	369	2765.26	546.335	41.730

It can be seen from Table 11 that the mean difference of vital capacity between group 1 and group 2 is 126 ml. Independent sample t test is performed on the data of vital capacity, and Table 12 is obtained. From Table 12, it can be seen that the Levin variance equality test is not significant. The results also verified that the students in group 2 were 126 ml more than those in group 1, and it was expected that the results of such a large difference would be significant. If the difference in lung capacity is obvious, there will also be a gap in 800 meters, which theoretically measures cardiopulmonary endurance. How to analyze the difference is shown in Table 13, 14.

Table 12: Independent sample test

		Levin's test for variance equality							Difference 95% confidence interval
		F	Salience	t	Degrees of Freedom	Sig. (Double tail)	Difference in mean	Standard error difference	Lower bound
Lung Capacity	Assumed equal variance	997.	318.	2.827	601	005.	126.041	44.578	38.493
	Equal variance is not assumed			2.868	519.183	004.	126.041	43.943	39.713

From the statistical data of the group, as predicted in the statistical vital capacity, the significant difference in vital capacity will certainly bring the difference in 800 meters. The average 800-meter performance of group 2 is 30 seconds, half a minute faster than the average performance of group 1, and it is tens of meters or even 100 meters in the running process, which is 10% faster than the students in group 1. According to the college students' physique "National students' physical health standards" scoring table, group 1, 4:08 results can get 70 points, group 2,4 minutes 39 seconds results get 55 points, the score difference is 15 points, relative to 50 meters, standing jump, sit-ups, lung capacity points difference this gap is very obvious, Should not be a simple difference in lung capacity on the impact of 800 meters, 800 meters in addition to the impact of cardiopulmonary function, but also varying degrees of endurance, will quality, etc.

Table 13: Groups of statistics

	Categories	Number of cases	Average	Standard deviation	Mean standard error
800 m	1	235	4.39	561.	037.
	2	369	4.08	490.	041.

Table 14: Independent sample test

		Levin's test for variance equality						
		F	Salience	t	Degrees of Freedom	Sig. (Double tail)	Difference in mean	Standard error difference
800 m	Assumed equal variance	642.	424.	5.370	376	000.	305.	057.
	Equal variance is not assumed			5.550	331.141	000.	305.	055.

As can be seen from Table 14, the variance is homogeneous, see the assumed result of equal variance,

P<0.01, the results have a significant difference, it is considered that the students in group 2 are better than the students in group 1 in 800 meters. That is, the cardiopulmonary ability and endurance quality of the students in group 2 are *obviously* better than the students in group 1.

4. Conclusion and analysis

From the perspective of the most basic physical conditions, the height and weight of girls in 2018 and 2022 show no difference in the average value and T-test. The height difference is only 0.1 cm, which can be ignored, and the weight difference is only 1 kg. Combined with BMI evaluation, there is no significant difference. The progress of physical fitness through the mean point of view of the gap is still very obvious, 50 meters faster than 0.4 seconds, standing long jump more than 11 centimeters, more than 7 percent, one minute sit-ups more than 6, the performance gap is the most obvious difference of 20 percent, lung capacity more than 126 milliliters; The average result of 800 meters is 30 seconds faster than the average result of group 1, the result is ten percent better, but this project according to the score than the standard score gap is the most obvious, reaching a 15 point gap. The data of 50m, standing long jump, sit-up, vital capacity and 800m were all superior to those of group 1 through independent sample t test. In other words, the speed quality, strength quality, explosive power, cardiopulmonary ability and endurance of the students of 2022 were superior to those of the girls of 2018.

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