

An Empirical Study on the Preventive Effect of Physical Exercise on Myopia in Adolescents

Chu Wang¹, Yonghua Wang^{2,*}, Yan Zou², Linye Zeng²

¹Shandong University of Arts, Jinan, Shandong, 250300, China

²Wenzhou Medical University, Wenzhou, Zhejiang, 325035, China

*Corresponding author

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Abstract: Through the comparative analysis of the effect of physical exercise on the prevention of myopia in teenagers, this article explores the physical education and sports forms that can effectively prevent myopia in teenagers, in order to improve the school physical education on the prevention of myopia in teenagers. Data collection, experimental and statistical research methods were used to compare the physical health and the degree of myopia of the 7-9 grade students in the junior sports school and junior middle school. First, there is a correlation between the results of physical exercise test and myopia. Students who scored higher on physical tests tend to have lower rates of myopia. Second, the incidence of myopia is related to individual sports results. According to the form and standard of national adolescent physical health test, students with the best performance in basketball, volleyball and foot sports have the lowest myopia rate. Appropriate physical exercise can effectively prevent myopia in teenagers. Therefore, school physical education should teach students according to their aptitude, gradually improve the exercise load, focus on improving the coverage and teaching quality of the three ball courses, and improve the quality of physical exercise to prevent myopia of teenagers.

1. Introduction

The definition of the concept of physical exercise: Physical exercise is a targeted physical exercise based on a sports group or a sports project. It has a clear organization form, exercise plan, a certain exercise load, and appropriate amount of exercise and intensity[1]. The study on the prevention of myopia in teenagers is to explore the mechanism of the concept of physical exercise in the prevention of myopia in teenagers[2]. In this paper, physical exercise is defined as a sport based on the basis of exercise load, through systematic physical education and sports training, to promote the physical health and coordinated physical and mental development of adolescents[3,4]. The definition of myopia: Myopia is the most common disease in clinical ophthalmology, mainly manifested by the change of refractive state of the eye and the gradual decline of vision[5]. The higher the degree of the eye, the longer the axis will be. In clinical division of the degree of myopia, usually the 0-300 degrees of myopia called low myopia, the 300-600 degrees of myopia called moderate myopia, the more than 600 degrees of myopia called high myopia[6]. According to the data from the Student Physique Health Monitoring Center of the Ministry of Education until 2018,

the myopia rate of Chinese teenagers was 36.0% in the fourth grade of primary schools, nearly 71.6% in the eighth grade, and 81.0% in high school students, making it the country with the highest myopia rate in the world[7]. The physical health of China's youth is worrying and the prevalence of myopia is high, with the myopia rate at the high school level at 81.0%, which seriously affects the quality of life of the overall well-off[8].

2. Research Materials and Research Methods

2.1. Object of Study

In 2021, 120 students were randomly selected from each of the general junior high schools and junior sports schools for physical fitness, including 40 students from each grade 7, 8 and 9, with a 1:1 ratio of male to female students, to collect physical fitness test data and test their visual acuity levels, and the physical fitness test and visual acuity data were statistically analyzed.

2.2. Measurement Methods

The "E" shaped International Standard Logarithmic Visual Acuity Scale box is used to check the visual acuity of the subject at a distance of 5m under adequate lighting conditions. The National Physical Fitness Test for Adolescents is used to test the physical fitness of students in Years 7-9. The tests are common to both boys and girls: 800-meter race for girls, 1000-meter race for boys, rope skipping, 50-meter race, basketball, volleyball and football.

2.3. Statistical Method

A database was established based on the valid data and test results obtained, and SPSS10.0 statistical software was applied to make a cross-sectional comparison and analysis of the data on physical health and myopia of the study subjects. Excluding uncertain factors such as genetics, lifestyle habits, pressure to go to school and eye hygiene, only a single factor was studied on the effect of physical exercise on myopia.

3. Results

3.1. Analysis of the Correlation between Adolescent Physical Fitness and Myopia

The onset of myopia is irreversible and physical exercise can only prevent and slow down the progression of myopia[9,10]. According to the Experimental Programme for Compulsory Education Curriculum Setting (Education Base [2001] No. 28), the proportion of physical education (P.E. and health) classes in compulsory education is 10-11% of the total class time, and P.E. and health classes in grades 7-9 are equivalent to 3 class hours per week. The physical education curriculum of general junior high schools is aligned with the content of the physical education test of the standard exam, so the courses are standing long jump, 50-meter race, 800-meter race, 1000-meter race, sit-ups, rope skipping, basketball, volleyball and football three major balls. The PE curriculum in the junior sports school accounts for 30 - 33%, with 9 - 11 hours per week, divided into basic fitness courses and sports specific courses. The volume of physical education courses in junior sports school is higher than that in ordinary middle school. The amount of exercise and intensity of single physical education course in junior sports school are higher than those in junior middle school. Due to the differences in physical education period, amount of exercise and exercise intensity, the test results of physical health and myopia of students are shown in Table 1. A comparative analysis of

the data revealed that the qualified rate, good rate and excellent rate of physical health test are better in junior sports school than in junior middle school, and the degree and proportion of myopia of junior middle school students are higher than that of junior sports school students. The proportion of qualified physical health and myopia of the students in the junior sports school is 98% and 35%, while the proportion of physical health and myopia of the students in junior middle school is 88% and 81%, respectively. The overall adolescent physical health is inversely proportional to myopia.

Table 1: Statistics on physical fitness tests and myopia levels among adolescents (N=120)

Contents	Failure	Qualified	Good	Excellent	Low myopia	Moderate myopia	High myopia
Junior Sports School Physical Fitness Test Myopia distribution	2	118	100	62	23	13	6
General Junior High School Physical Fitness Test Myopia Distribution	15	105	76	42	40	42	15

3.2. Correlation Analysis between Adolescent Health Level and Myopia Level

Table 2: Correlation analysis between the level of physical fitness rating and the degree of myopia among adolescents (N=120)

Contents	Category	Frequency (persons)	Low myopia	Moderate myopia	High myopia	Myopia
Junior Sports School's Physical Fitness Test	Failure	2	0	1	1	100%
	Qualified	18	6	5	2	83%
	Good	38	10	4	3	45%
	Excellent	62	7	3	0	16%
General Junior High School's Physical Fitness Test	Failure	15	5	6	4	100%
	Qualified	29	10	13	5	97%
	Good	34	15	12	4	91%
	Excellent	42	10	11	2	55%

The correlation between the physical fitness levels of adolescents and the degree of myopia is shown in Table 2. The statistical analysis of the physical health test and myopia of the students in junior sports school and junior middle school shows that the students in junior sports school are better than the students in junior middle school in all levels of physical health test, but less than the students in junior middle school in all levels of myopia. There is an inverse correlation between junior sports school and ordinary high school in the analysis of myopia in each physical health test grade. The nearsightedness of the students in the junior sports school is 100%, 83%, 45% and 16% respectively in the grades of unqualified, qualified, good and excellent. In general middle school, the number of nearsighted students in the grades of unqualified, qualified, good and excellent is 100%, 97%, 91% and 55%, respectively. With the improvement of physical health test results, the proportion of myopia gradually decreased, the number of myopia students in youth sports schools was less than that in ordinary middle schools, and the decrease trend of myopia number in the improvement of physical health level was better than that in ordinary middle school students. The lower the results of physical health test, the higher the myopia rate. Statistics show that the myopia of teenagers is inversely proportional to physical health.

3.3. Correlation between Single Item Scores and Myopia in Adolescent Physical Fitness Tests

The data from the adolescent physical fitness test uses common test items for both boys and girls, and each student selects the best one test score as the basis for statistics, so as to classify the myopia situation for statistics. The statistical results are shown in Table 3. The distribution of mild myopia, moderate myopia and high myopia among teenagers shows an obvious feature of concentration of events. The students with advantages in jumping rope and explosive power are relatively concentrated in myopia, followed by aerobic endurance running. This is related to the way of ball games. Ball games are comprehensive sports and highly coordinated with the whole body. With strong interaction, students have a high enthusiasm to participate in and promote the high excitement of the nervous system.

Table 3: Statistics on single sport performance and myopia level in physical fitness test (N=120)

Contents	Failure	Qualified	Good	Excel-lent	Low myopia	Moderate myopia	High myopia
Junior Sports School							
50m	2	17	31	64	4	4	1
800/1000m	2	16	32	58	7	2	2
Jump rope	0	18	37	76	10	6	2
Basketball, Volleyball and Football	1	15	37	50	4	1	0
General Junior High School							
50m	15	23	40	40	8	10	4
800/1000m	14	22	45	41	8	6	3
Jump rope	11	28	47	41	18	19	7
Basketball, Volleyball and Football	13	26	31	36	6	5	1

4. Conclusion

4.1. Different Physical Activity Exercise Loads Have an Important Role in the Prevention of Myopia in Adolescent Students

Junior sports school is specialized in teaching sports techniques, which has a high degree of specialization in physical exercise, systematic teaching of the curriculum, and a high intensity and volume of exercise. Objectively, it has a positive promoting effect on the improvement of adolescent physique. The physical quality and visual acuity of junior sports school students are better than those of junior middle school students, which has a positive preventive effect on juvenile myopia. In contrast, physical exercise in junior middle school is mainly in the form of physical education, and the amount of exercise and intensity of physical education are weaker than those in junior sports schools. It can be seen that strengthening the quality of physical education and improving physical education exercise load are important measures to prevent teenagers from myopia. This requires education departments and schools to strengthen the sports safety system and material security.

4.2. Youth Physical Fitness Levels are Highly Correlated with Myopia

There is a linear correlation between the physical health status of adolescents and the degree of myopia, with better physical health test scores being associated with less myopia. First, the

improvement of physical health can prevent the occurrence of myopia in teenagers. Secondly, physical exercise indirectly reduces teenagers' learning time by depriving them of energy and time, thus improving the eye environment and promoting eye hygiene. Or maybe it's a combination of the two. In short, strengthening the improvement of teenagers' physical health has an obvious effect on the prevention of teenagers' myopia. At present, it is urgent to improve the teaching quality of junior high school physical education courses.

4.3. There is a Correlation between Youth Myopia and Physical Activity Programs

Statistics on individual scores on physical fitness tests and myopia finds that there is a statistically significant relationship between adolescent myopia and physical exercise programs. Students with excellent scores on the three major ball tests of basketball, volleyball and football, whether in junior sports school or junior middle school, have the lowest overall myopia rates and the lowest overall distribution of mild, moderate and severe myopia. It can be concluded that there is a significant difference in the prevention of myopia among young people depending on the form of physical activity. The teaching of the youth physical education curriculum should focus on the learning of the three major sports content, increasing its weighting and measurement, improving athletic ability and exercise levels, and effectively preventing the occurrence of myopia in adolescents.

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