

38 Analysis and research on the benefits of table tennis activities in improving the fitness of teenagers

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1 Introduction

The primary and middle school students are now experiencing more and more pressure from the study. It indicates more and more intensively competitive of the times. High expectation of their parents leads to big burden on the students; as a result, it is severely harmful to the health of mental and physical development of the teenagers.

Result of 《Supervision and measurement of health of students in 2000》indicates that fitness of teenager students in our country shows a decreasing trend compared with that of 1985 and 1995, especially in heart and lung function, reaction and eyesight. However, what is the effect of table tennis activities, as a key event in sports education, on the improvement of students' fitness? We have done experiments and researches on this point.

2 Methods

2.1 Participants

120 pupils from Chengxi Middle School and Junmin Primary School in Fujian Province are chosen as objectives of our research. They are divided into two groups and they have been tested for half years. During this period, students of experimental group attended table tennis exercise under the guide of coach 3 times a week and 90 minutes for each time. The comparison group only attended normal P. E lesson and they have not other sports exercise. Table 1 shows the details.

2.2 Methods of research

Tests of heart and lung function, reaction and eyesight have been undertaken, while the statistics software such as SPSS and EXCEL has processed outcomes of these tests. Furthermore, analysis and research have been done with the method of comparison (experimental group VS comparison group).

Table 1. General situation of experiment objectives

Schools	Objectives	Groups	Number	Remarks
Chengxi Middle School	17 ~ 18 aged pupils	Experimental group	30	with more than 4 yrs experience in extracurricular table tennis playing
		comparison group	30	with no hobby in sports
Junmin Primary School	11 ~ 12 aged pupils	Experimental group	30	with more than 4 yrs experience in extracurricular table tennis playing
		comparison group	30	with no hobby in sports

3 Results and Discussion

3.1 Heart function test

The simplified measurement of heart function is a simple method to test the change of heart function when specific load is borne. It is one of the scientific research productions of Sweden Sports Union. The format is: $\text{Index} = (P1 + P2 + P3 - 200) / 10$. Smaller index indicates better heart function. Table 2 shows data of testing of heart function. Table 3 is the table of T - test.

Table 2. Comparison of heart test data

	N	P1 average	P2 average	P3 average	Average index
Experimental group (11 ~ 12 aged)	30	74.4	126.13	94.53	10.44
comparison group (11 ~ 12 aged)	30	79.73	135.73	111.33	12.68
Experimental group (17 ~ 18 aged)	30	70.08	104.27	85.20	5.62
comparison group (17 ~ 18 aged)	30	76.00	115.20	94.93	8.59

Note: (P1) pulse when quiet, (P2) pulse after 30 times went down, (P3) pulse after one minute rest.

Table 3. T - test (heart function)

	Variance	Observation value	P(T < = t) one tailed	level of significance
Experimental group (11 ~ 12 aged)	1.22	30 pupils in each group	1.46631E - 10	0.05
comparison group (11 ~ 12 aged)	1.40			
Experimental group (17 ~ 18 aged)	1.39	0 pupils in each group	5.63E - 13	0.05
comparison group (17 ~ 18 aged)	1.80			

It is on the assumption that there are no distinct differences in heart function index between table tennis amateurs and normal students. Under the T - test hypothesis, it indicates: ①P value of children from 11 to 12 group equals $1.46631E - 10$ ($p < 0.05$). So null hypothesis is rejected and alternative hypothesis is accepted. Index of experimental group is less than that of comparison group. ②P value of children from 17 to 18 group equals $5.63E - 13$ (also $p < 0.05$). So null hypothesis is rejected and alternative hypothesis is accepted. Index of experimental group is less than that of comparison group. P - value of two age groups are both less than the level of significance.

Teenagers are experiencing a fast growing period. The development of every part of their bodies is not stable yet. Under common circumstance, their multiple organs, especially cardiovascular system grows slower than their outside organs such as skeleton and muscle. So overload exercises should be avoided, otherwise, it will damage the cardiovascular system.

Intensity of table tennis exercise is quite moderate. Continuous bating and moving in table tennis playing will help to improve the function of heart. Long - term exercise will surely improve the function of cardiovascular system. Comparison of test data in this essay also shows: heart function of the experimental group (students with more than 3 years experience in table tennis training) is much better than that of comparison group. It proves playing table tennis frequently exert positive effect on improvement of heart function.

3.2 Eyesight test

These years, short eyesight becomes more common, especially among the teenagers. According to the statistics, short eyesight in middle school students is at the rate of 58% and 80% for college students. Therefore, how to prevent short eyesight has become a hot top.

Data of eyesight test is undertaken in 6 meters standard. Larger value stands for better eyesight. Table 4 shows the experiment data and Table 5

shows T - test.

Table 4. Data comparison (eyesight test)

	Experimental Group (11 ~ 12 aged)	Comparison group (11 ~ 12 aged)	Experimental Group (17 ~ 18 aged)	Comparison Group (17 ~ 18 aged)	Remark
average eyesight of two eyes	5.018	4.835	5.027	4.612	Distance (6 meters)

Table 5. T - test (eyesight test)

	Variance	P(T < = t) one tail	Observation value	level of significance	Average
Experimental group (11 ~ 12 aged)	0.010428				5.018333
comparison group (11 ~ 12 aged)	0.016405	4.96E - 08		0.05	4.835
Experimental group (17 ~ 18 aged)	0.006851		30 pupils in each group		5.026667
comparison group (17 ~ 18 aged)	0.022704	2.09E - 17		0.05	4.611667

Our assumption is that there are no distinct differences in eyesight between table tennis amateurs and normal pupils. Under the T - test hypothesis, it indicates: ①P value of children from 11 to 12 group equals 4.96E - 08 (< 0.05). So null hypothesis is rejected and alternative hypothesis is accepted. Index of experimental group is higher than that of comparison group. ②P value of children from 17 to 18 group equals 2.09E - 17 (also < 0.05). So null hypothesis is rejected and alternative hypothesis is accepted. Index of experimental group is higher than that of comparison group. P - value of two age groups are both less than the level of significance.

Physical research proves that using eyes for long time and incorrect reading habits are the major causes of short eyesight. Therefore, controlling of the time of looking at steady objectives is one of the most important measures to prevent short eyesight. When playing table tennis, we focus our eyes on the fast moving ball. The speed and moving direction of the ball varies from time to time. The relative position of our eyes and the balls changes continuously. Thereby, it helps to improve the function of contraction and relaxation of ciliary muscle. The outcomes of our research have proved that frequent table ten-

nis exercise exerts a positive effect on the eyesight of teenagers.

3.3 Reaction of hands test

The index shows how fast the hands react to visual stimulation. It reflects the degree of acuteness of people's optic nerve and nerve center directly. Clock ruler is chosen as implement of measurement. Corresponding value of experiment data can be checked out from Table 8. Table 6 shows the experiment data of reaction speed. Table 7 is the table of T - test.

Table 6. Data comparison

	Experimental Group (11 ~ 12 aged)	Comparison group (11 ~ 12 aged)	Experimental Group (17 ~ 18 aged)	Comparison Group (17 ~ 18 aged)	Remark
Averages	16.57	26.45	8.22	15.07	At the same condition

Table 7. T - test (Reaction of hands)

	Variance	P(T < = t) one - tailed	Observation value	Averages	Level of significance
Experimental group (11 ~ 12 aged)	21.00	2.02E - 12	30 pupils in each group	16.57	0.05
comparison group (11 ~ 12 aged)	17.27			26.44	
Experimental group (17 ~ 18 aged)	3.55	5.91E - 15		8.22	0.05
comparison group (17 ~ 18 aged)	8.56			15.07	

Our assumption is that there are no distinct differences in reaction speed between table tennis amateurs and normal pupils. Under the T - test hypothesis, it indicates: ①P value of children from 11 to 12 group equals 2.02E - 12 (< 0.05). So null hypothesis is rejected and alternative hypothesis is accepted. Experimental group performed better than the comparison group. ②P value of children from 17 to 18 group equals 5.91E - 15 (also < 0.05). So null hypothesis is rejected and alternative hypothesis is accepted. That is to say value of comparison is different from that of experiment group at the level of significance. Index of experimental group is higher than that of comparison group. Experimental group performed better than the comparison group.

The basic manner of activity of our nerve system is reflex. It is categorized into conditioned reflex and un - conditioned reflex. Reflex is defined as the reaction of the nerve system to the internal and external stimulations in the process of adjustment on organs engineering. Our experiment shows that due to high plasticity of children's organs and nerve system, frequent table tennis ex-

ercise with the characteristics of fast and changeable will help to fix relative reflex and improve the ability of reaction.

4 Conclusions and suggestion

4.1 Conclusions

Our research indicates: frequent table tennis exercises help to advance the heart function, eyesight and reaction ability of hands and eyes. Meanwhile, it is proved that table tennis activities play as a key role in carrying out the strategy of national sports.

4.2 Suggestion

Firstly, we hold that in order to prevent table tennis from becoming unpopular among middle school students, it is necessary to understand the effect of table tennis exercise in schools. As an extracurricular activity, it helps to train talents of athletics sports. Being part of P. E lessons, it helps the pupils to learn about knowledge and skill of table tennis. Being an extracurricular activity, table tennis has the characteristics of recreation and fitness. Furthermore, it has prominent effect on reducing both physical and mental burdens on teenagers.

Secondly, it is necessary to enhance the promotion of table tennis exercise, so as to stimulate the interest in attending table tennis activities and provide more opportunities for them to have actual experience in table tennis playing. It is also necessary to provide professional advices on the trainings of table tennis tutors (coaches) and improvements of equipments and facilities.