

# IMPACTS OF TABLE TENNIS ON THE HEALTH OF YOUNG STUDENTS



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IMPACTOS DO TÊNIS DE MESA SOBRE A SAÚDE DE JOVENS ESTUDANTES

IMPACTOS DEL TENIS DE MESA EN LA SALUD DE JÓVENES ESTUDIANTES

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## ABSTRACT

**Introduction:** By improving the material level of life, the amount of exercise of adolescents is decreasing, leading the muscular strength and cardiorespiratory resistance to also decrease instead of increase. Therefore, it is urgent to present effective training methods in physical education teaching to benefit adolescents' quality of life. **Objective:** Study the effect of table tennis training on musculature and cardiorespiratory endurance in young students. **Methods:** 60 students from grade 7 of a high school were randomly divided into experimental and control groups. The experiment lasted for 9 weeks. In this paper, intra-group comparisons and inter-group comparisons were used. Before the experiment and after 9 weeks of training, students had their biophysical indicators collected; these data were analyzed and statistically compared. **Results:** Existing physical education training can overall improve students' physical muscular and cardiopulmonary endurance. The results show that the current training is effective, but inferior to that experienced with table tennis, and should be adjusted. **Conclusion:** In teaching high school youth, physical education teachers are advised to promote table tennis to promote the young student's health. **Level of evidence II; Therapeutic studies - investigation of treatment outcomes.**

**Keywords:** Adolescents; Racquet Sports; Physical Endurance.

## RESUMO

**Introdução:** Ao melhorar o nível de vida material, a quantidade de exercício dos adolescentes está diminuindo, levando a força muscular e a resistência cardiorrespiratória a também diminuírem ao invés de aumentar. Portanto, é urgente apresentar métodos de treinamento eficazes no ensino da educação física, visando beneficiar o nível de qualidade de vida dos adolescentes. **Objetivo:** Estudar o efeito do treinamento de tênis de mesa sobre a musculatura e a resistência cardiorrespiratória em jovens estudantes. **Métodos:** 60 alunos da série 7 de uma escola de ensino médio foram aleatoriamente divididos em grupo experimental e controle. O experimento durou 9 semanas. Neste trabalho, foram usadas a comparação intragrupo e a comparação intergrupo. Antes do experimento e após 9 semanas de treinamento, os alunos tiveram seus indicadores biofísicos coletados, esses dados foram analisados e comparados estatisticamente. **Resultados:** O treinamento de educação física existentes podem melhorar globalmente a resistência muscular física e cardiopulmonar dos alunos. Os resultados mostram que o treinamento atual é eficaz, porém inferior ao experimentado com o tênis de mesa, devendo ser ajustados. **Conclusão:** Na atual situação do ensino para jovens do ensino médio, é aconselhado aos professores de educação física promoverem o tênis de mesa como uma medida auxiliar na promoção integral da saúde do jovem estudante. **Nível de evidência II; Estudos terapêuticos - investigação dos resultados do tratamento.**

**Descritores:** Adolescentes; Esportes com Raquete; Resistência Física.

## RESUMEN

**Introducción:** Al mejorar el nivel de vida material, la cantidad de ejercicio de los adolescentes está disminuyendo, lo que hace que la fuerza muscular y la resistencia cardiorrespiratoria también disminuyan en lugar de aumentar. Por lo tanto, es urgente presentar métodos de formación eficaces en la enseñanza de la educación física, con el objetivo de beneficiar el nivel de calidad de vida de los adolescentes. **Objetivo:** Estudiar el efecto del entrenamiento de tenis de mesa sobre la musculatura y la resistencia cardiorrespiratoria en jóvenes estudiantes. **Métodos:** 60 estudiantes de 7º curso de un instituto se dividieron aleatoriamente en grupo experimental y grupo de control. El experimento duró 9 semanas. En este trabajo se utilizó la comparación intragrupo y la comparación intergrupo. Antes del experimento y después de 9 semanas de entrenamiento, se recogieron los indicadores biofísicos de los estudiantes, se analizaron estos datos y se compararon estadísticamente. **Resultados:** El entrenamiento de educación física existente puede mejorar la resistencia física muscular y cardiopulmonar general de los estudiantes. Los resultados demuestran que el entrenamiento actual es eficaz, pero inferior al experimentado con el tenis de mesa, y debería ajustarse. **Conclusión:** En la situación actual de la enseñanza para jóvenes de secundaria, se aconseja que los profesores de educación física promuevan el tenis de mesa como medida auxiliar en la promoción integral de la salud del joven estudiante. **Nivel de evidencia II; Estudios terapéuticos - investigación de los resultados del tratamiento.**

**Descriptorios:** Adolescentes; Deportes de Raqueta; Resistencia Física.



## INTRODUCTION

The physical health of teenagers is an important goal of physical education. At present, with the continuous development of science and technology, people's life is becoming more and more convenient.<sup>1</sup> Elevators, cars, takeout and so on make teenagers less and less exercise in their daily life, which leads to the decline of physical fitness and the decline of cardiopulmonary endurance. In the long run, it is bound to have a serious impact on the overall physical development of young people and affect the improvement of the quality of China's population.<sup>2</sup> Therefore, it is necessary to add some sports items in the daily physical education teaching of teenagers to make them interesting and promote the improvement of their sports ability. Table tennis has a good mass foundation in China, and its site construction cost is low and the construction period is short. Therefore, it is widely favored by school physical education teachers.<sup>3</sup> Through the table tennis training for teenagers, the physical and psychological quality of students can be effectively improved, so as to promote the physical and mental health of teenagers.<sup>4</sup> In order to further explore the influence of table tennis training on Teenagers' muscle quality and cardiopulmonary endurance, this paper conducted table tennis training for a middle school student, and explored this problem from three aspects: the comprehensive quality of upper limb strength, the cardiopulmonary function and the change of aerobic capacity, so as to verify the effectiveness of table tennis training on Teenagers' quality improvement.<sup>5,6</sup>

## METHOD

Firstly, this paper uses the literature research method to consult the development needs of teenagers' muscle strength and cardiopulmonary endurance, and studies the training methods of table tennis in teenagers, so as to have a more scientific understanding of this research. Then, after designing the experimental scheme, we communicate with sports experts, medical experts and front-line sports teachers to improve the training scheme and determine the final training scheme. Finally, on the basis of obtaining the full consent of teachers and guardians, 60 students were selected from the seventh grade students of a middle school according to the principle of voluntariness. The study and all the participants were reviewed and approved by Ethics Committee of Northeast Agricultural University (NO.20NEAU75-SR). They were divided into the experimental group and the control group by drawing lots. The basic information of the two groups is shown in Table 1.

60 students were divided into the experimental group and the control group. The students in the control group normally participated in the regular running and broadcasting exercises in the school in the physical education class. The students in the experimental group carried out table tennis training in the same time. The time and frequency of sports were carried out according to the frequency of the school physical education class. The experiment lasted for 9 weeks. In the whole process, the students' diet and work and rest are almost the same, thus reducing the interference of human factors. In this paper, intra group comparison and inter group comparison were used. Before the experiment and after 9 weeks of training, the students measured the relevant indicators, and collated and analyzed the data.

## RESULTS

### Effect of table tennis training on body muscles

Table 2 shows the changes of upper limb muscle quality of the two groups of students before and after table tennis training.

**Table 1.** Basic information of experimental group and control group.

Group	Age	Height (cm)	Weight (kg)
test group	13.112±0.491	160.745±8.538	55.855±14.535
Control group	12.565±0.808	159.320±8.231	56.226±14.026

It can be seen from Table 2 that the spiking distance of the experimental group increased significantly from 7.571 ± 1.062 m before training to 9.924 ± 1.075 m after training (P < 0.05), indicating that there was a significant difference. The number of forehand attacks and swings in 1min increased significantly from 66.833 ± 6.113 times before training to 70.626 ± 6.340 times after training (P < 0.05), indicating a significant difference. The dominant hand grip strength increased significantly from 30.222 ± 9.890kg before training to 36.467 ± 9.811kg after training (P > 0.05), indicating that there was no significant difference. The 30 s fast dumbbell bending lift increased significantly from 19.805 ± 2.152 times before training to 21.915 ± 2.248 times after training (P > 0.05), indicating that there was no significant difference. It can be seen from the intra group comparison and inter group comparison in Table 2 that the upper limb muscle quality of the students has been improved before and after the training, and the improvement range of the experimental group is higher than that of the control group.

### Effect of table tennis training on cardiopulmonary endurance

The impact of table tennis on cardiopulmonary endurance was divided into two parts in the study: changes in cardiac function indexes and changes in pulmonary function indexes, as shown in Table 3 and Table 4.

It can be seen from table 3 that the EDV index of the experimental group increased from 85.099 ± 12.594ml before training to 91.501 ± 14.577ml after training, P > 0.05, indicating that there is no significant difference. The EDV index of the control group increased from 85.917 ± 11.162ml before training to 91.038 ± 12.354ml after training (P > 0.05), indicating that there was no significant difference. Compared with the control group, both the experimental group and the control group were improved and the difference was not significant. It shows that there is little difference between table tennis training and routine physical training in the impact on left ventricular end diastolic volume.

**Table 2.** Changes of upper limb muscle quality of two groups of students before and after training.

Option	Group	Before	After	t	P
Far strike far (m)	test group	7.571±1.062	9.924±1.075	2.5763	0.0133
	Control group	7.730±0.937	8.076±1.161	0.6282	0.0435
1 min is playing at the ball (times)	test group	66.833±6.113	70.626±6.340	5.0621	0.0000
	Control group	65.936±8.442	68.394±7.776	0.7530	0.4623
Handling power (kg)	test group	30.222±9.890	36.467±9.811	0.8025	0.4317
	Control group	27.867±7.310	29.338±7.290	0.2244	0.8038
30s fast dumbbell bending (times)	test group	19.805±2.152	21.915±2.248	1.1376	0.9184
	Control group	19.757±2.147	20.700±1.970	0.8757	0.4904

**Table 3.** Changes of cardiac function indexes of two groups of students before and after training.

Option	Group	Before	After	t	P
EDV(ml)	test group	85.099±12.594	91.501±14.577	3.6898	0.2404
	Control group	85.917±11.162	91.038±12.354	2.0338	0.3515
SV(ml)	test group	57.016±9.839	62.206±11.628	2.5217	0.0705
	Control group	60.481±9.449	64.721±10.117	2.3510	0.0128

**Table 4.** Changes of lung function indexes of two groups of students before and after training.

Option	Group	Before	After	t	P
VC(L)	test group	3.260±0.616	3.680±0.536	0.3169	0.0474
	Control group	3.012±0.425	3.261±0.367	0.1092	0.0489
MVV(L/min)	test group	79.632±19.996	93.657±16.067	9.5140	0.0440
	Control group	78.945±14.915	88.942±22.235	7.5505	0.0296
Vital capacity index	test group	55.534±10.492	64.734±10.817	7.4306	0.2671
	Control group	52.360±8.554	57.137±8.174	2.8161	0.0496

In terms of stroke output, the SV index of the experimental group increased from  $57.016 \pm 9.839$ ml before training to  $62.206 \pm 11.628$ ml after training,  $P > 0.05$ , indicating that there was no significant difference. The SV index of the control group increased from  $60.481 \pm 9.449$ ml before training to  $64.721 \pm 10.117$ ml after training ( $P < 0.05$ ), indicating a significant difference. Compared with the control group, both the experimental group and the control group have improved, and the improvement of the experimental group is greater than that of the control group. It shows that table tennis training has more advantages in the impact on stroke output.

It can be seen from table 4 that the VC index of the experimental group increased from  $3.260 \pm 0.616$ l before training to  $3.680 \pm 0.536$ l after training,  $P < 0.05$ , indicating that there is a significant difference. The VC index of the control group increased from  $3.012 \pm 0.425$ l before training to  $3.261 \pm 0.367$ l after training ( $P < 0.05$ ), indicating a significant difference. From the comparison, we can see that both of them have improved, and the improvement of the experimental group is greater than that of the control group. It shows that table tennis training has more advantages in the influence on vital capacity.

In terms of maximum ventilation, the MVV index of the experimental group increased from  $79.632 \pm 19.996$ l/min before training to  $93.657 \pm 16.067$ l/min after training ( $P < 0.05$ ), indicating that there was a significant difference. The MVV index of the control group increased from  $78.945 \pm 14.915$ l/min before training to  $88.942 \pm 22.235$ l/min after training ( $P < 0.05$ ), indicating a significant difference. From the comparison, we can see that both of them have improved, and the improvement of the experimental group is greater than that of the control group. It shows that table tennis training has more advantages on the influence of maximum ventilation.

In terms of vital capacity index, the vital capacity index of the experimental group increased from  $55.534 \pm 10.492$  before training to  $64.734 \pm 10.817$  after training,  $P > 0.05$ , indicating that there was no significant difference. The index of vital capacity in the control group increased from  $52.360 \pm 8.554$  before training to  $57.137 \pm 8.174$  after training ( $P < 0.05$ ), indicating a significant difference. From the comparison, we can see that both of them have improved, and the improvement of the experimental group is greater than that of the control group. It shows that table tennis training has more advantages in the influence on vital capacity index.

### The influence of table tennis training on Teenagers' aerobic exercise ability

The combination of changes in body muscles and changes in cardiopulmonary endurance will have a certain impact on Teenagers' aerobic exercise ability. Table 5 shows the changes in teenagers' aerobic exercise ability before and after training.

From the comparison perspective in the group, the experimental group  $VO_{2max}$  index was raised from  $2177.259 \pm 238.730$  mL/min before training to  $2588.186 \pm 336.946$  mL/min after training;  $VO_{2max}$ /weight indicators were increased from  $36.993 \pm 3.608$  mL/min-kg before training to After training  $45.205 \pm 4.849$  mL/min-kg,  $P < 0.05$  indicates that there are significant differences. The control group  $VO_{2max}$  index was raised from  $2088.727 \pm 249.736$  mL/min before training to  $2516.853 \pm 324.427$  mL/min;  $VO_{2max}$ /weight index was increased from  $35.929 \pm 3.378$  mL/min-kg before training to  $43.937 \pm 4.616$  after training. mL/min-kg,  $P > 0.05$ , indicating that there is no significant difference.

## DISCUSSION

Young people are at a critical stage of growth, and their cardiopulmonary is still in the developmental period. Therefore, at this stage, scientific cardiopulmonary ability exercise can effectively improve the

**Table 5.** Changes of aerobic exercise ability of two groups of students before and after training.

Option	Group	Before	After	t	P
$VO_{2max}$ (mL/min)	test group	2177.259±238.730	2588.186±336.946	342.5456	0.0850
	Control group	2088.727±249.736	2516.853±324.427	323.5039	0.1946
$VO_{2max}$ /weight (mL/min-kg)	test group	36.993±3.608	45.205±4.849	7.0330	0.0267
	Control group	35.929±3.378	43.937±4.616	6.4339	0.0874

cardiopulmonary ability of young people. Studies have shown that effective training can improve the human respiratory muscle contraction function, enhance the elasticity of lung tissue and thorax, and reduce the resistance of the respiratory tract during breathing, thereby making the gas unobstructed better. The increase in lung capacity has effectively improved the breathing depth of young people. Therefore, the efficiency and intensity during gas exchange have improved, reducing the sense of lung discomfort during exercise, and providing more oxygen for the body. Similarly, effective exercise training can improve the output function of the left ventricle of the heart. Long-term exercise can promote the adaptive changes of the heart structure, improve myocardial contraction ability, expand the indoor cavity and ventricular volume of the left heart, and improve the blood function of the heart. The supply of nutrients and oxygen. In the past teaching practice, it can be found that although the exercise such as broadcast exercises, running, and other movements can mobilize students' physical muscles and bones to exercise, and to some extent improve their cardiopulmonary endurance levels, these actions are relatively boring, and many of them are relatively boring. Students are not interested in them, perfunctory things in exercise, making exercise effects poorly. Therefore, in the course design of adolescent sports training, we must choose the training method of adolescents in conjunction with the actual situation of the youth.

## CONCLUSION

It can be seen from the research in this article that compared with the current existing physical education training, you can better improve the development of your muscle strength and cardiopulmonary endurance, thereby improving the aerobic exercise ability of your muscle strength and cardiopulmonary endurance. Therefore, in the current youth physical education teaching, teachers should take targeted increase in table tennis teaching training, thereby promoting the comprehensive development of young people. It can be seen in practical teaching that the sports quality of adolescents not only includes aerobic training and cardiopulmonary endurance, but also many other parts. Therefore, physical education teachers should improve their physical fitness and psychological quality improvement according to the needs of current physical education teaching. Start with both aspects, comprehensive design sports teaching solutions, thereby promoting the healthy development of young people's physical fitness, and providing good physical protection for young people's learning.

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