ABDOMINAL CORE TRAINING IN TABLE TENNIS PLAYERS

TREINAMENTO DO CENTRO ABDOMINAL EM JOGADORES DE TÊNIS DE MESA

ENTRENAMIENTO DEL NÚCLEO ABDOMINAL EN JUGADORES DE TENIS DE MESA

ORIGINAL ARTICLE
ARTIGO ORIGINAL
ARTÍCULO ORIGINAL

Dahui Ma[1]
(Physical Education Professional)
Zhiyong Fu[2]
(Physical Education Professional)
Dae-Hee Kim[3]
(Physical Education Professional)

1. Suqian University, The PE Department, Jiangsu, China.
2. Qiongtai Normal University, Public Sports Teaching and Research Office, Haikou, Hainan, China.
3. Pukyeong National University, Department of Marine Sports, Busan, Korea.

Correspondence:
Zhiyong Fu
Haikou, Hainan, China. 571127.
fuzhiy1978@163.com

ABSTRACT

Introduction: The current teaching mode of table tennis in China is satisfactory, but there are still some problems that are the focus of physical education teachers, such as the low efficiency of sports training. Objective: Study the effect of abdominal core training on table tennis teaching. Methods: Volunteers trained in table tennis at a physical education college were divided into the experimental and control group. Before and after the beginning of the experiment, table tennis students' physical indices and overall physical scores were obtained under a parameterized protocol. Results: The overall score of the experimental group resulted from 7.355 (± 1.827) to 9.072 (± 1.992) before training, and the mean difference was 1.2581 points ($P < 0.05$), indicating a significant difference. The control group score increased from 7.606 (± 1.937) to 7.989 (± 1.440) before training, and the mean difference was 0.1976, $P > 0.05$, indicating no significant difference. Conclusion: Compared with the current way of teaching table tennis, the scheme proposed in this paper showed better sports efficiency and could help students to improve their physical quality and sports ability. ***Level of evidence II; Therapeutic studies - investigation of treatment outcomes.***

Keywords: Racquet Sports; Abdominal Core; Physical Education and Training.

RESUMO

Introdução: O atual modo de ensino do tênis de mesa na China é satisfatório, mas ainda existem alguns problemas que são o foco dos professores de educação física, como a baixa eficiência do treinamento esportivo. Objetivo: Estudar o efeito do treinamento do centro abdominal no ensino do tênis de mesa. Métodos: Voluntários formados em tênis de mesa em uma faculdade de educação física foram divididos em grupo experimental e de controle. Antes e depois do início da experiência, foram obtidos os índices físicos dos alunos de tênis de mesa e a pontuação física geral sob um protocolo parametrizado. Resultados: A pontuação geral do grupo experimental resultou em 7,355 (± 1,827) para 9,072 (± 1,992) antes do treinamento, e a diferença média foi de 1,2581 pontos (P < 0,05), indicando uma diferença significativa. A pontuação do grupo de controle aumentou de 7,606 (± 1,937) para 7,989 (± 1,440) antes do treinamento, sendo a diferença média de 0,1976, P > 0,05, indicando que não houve diferença significativa. Conclusão: Em comparação com o atual modo de ensino do tênis de mesa, o esquema proposto neste trabalho apresentou melhor eficiência esportiva podendo ajudar os estudantes a melhorar a sua qualidade física e habilidade esportiva. ***Nível de evidência II; Estudos terapêuticos - investigação dos resultados do tratamento.***

Descritores: *Esportes com Raquete; Centro Abdominal; Educação Física e Treinamento.*

RESUMEN

Introducción: El modo de enseñanza actual del tenis de mesa en China es satisfactorio, pero todavía hay algunos problemas que son el centro de atención de los profesores de educación física, como la baja eficiencia del entrenamiento deportivo. Objetivo: Estudiar el efecto del entrenamiento del núcleo abdominal en la enseñanza del tenis de mesa. Métodos: Los voluntarios entrenados en tenis de mesa en una escuela de educación física se dividieron en grupo experimental y grupo de control. Antes y después del inicio del experimento, se obtuvieron los índices físicos de los alumnos de tenis de mesa y la puntuación física global bajo un protocolo parametrizado. Resultados: La puntuación global del grupo experimental pasó de 7,355 (± 1,827) a 9,072 (± 1,992) antes del entrenamiento, y la diferencia media fue de 1,2581 puntos (P < 0,05), lo que indica una diferencia significativa. La puntuación del grupo de control aumentó de 7,606 (± 1,937) a 7,989 (± 1,440) antes del entrenamiento, y la diferencia media fue de 0,1976, P > 0,05, lo que indica que no hubo diferencias significativas. Conclusión: En comparación con la forma actual de enseñar el tenis de mesa, el esquema propuesto en este trabajo presentaba una mayor eficacia deportiva y podía ayudar a los alumnos a mejorar su calidad física y su capacidad deportiva. ***Nivel de evidencia II; Estudios terapéuticos - investigación de los resultados del tratamiento.***

Descriptores: *Deportes de Raqueta; Núcleo Abdominal; Educación y Entrenamiento Físico.*

DOI: http://dx.doi.org/10.1590/1517-8692202329012022_0511 Article received on 09/20/2022 accepted on 10/21/2022

INTRODUCTION

China has advanced theoretical knowledge and training and teaching mode. The public participation in the project is very high. The social project infrastructure is very perfect. The results of table tennis are among the best in all competitions in the world.[1] Therefore, the development of table tennis in China is very mature. The promotion of table tennis is conducive to the development of the talent reserve of China's table tennis events, and can solve the problem of the replacement of the old and the new among the high-level athletes. So that China's project level has always remained competitive.[2] Participating in table tennis is beneficial to students' physical and mental development. Table tennis can effectively improve the physical function index of students and exercise their reaction ability. With the development of society, people's investment in sports began to increase significantly. People actively pursue high-quality sports experience, especially the students of major universities.[3] Students are interested in learning professional project theory knowledge and are more interested in joining professional training teams. Almost all major colleges and universities offer elective courses related to table tennis. Professional courses help students understand the project more comprehensively, systematic learning and professional training, and help students improve their technical level steadily.[4] In the professional training links, table tennis related core strength training is particularly important. It is necessary to use scientific core strength training methods to effectively improve the level of sports and help the body maintain a high-intensity competitive state. At the same time of training, reasonable nutrition intervention as an assistant is equally important.[5] In high-intensity training, sports consumption will increase, and the body needs a lot of nutrients to recover and improve. Individual nutrients act as catalysts and can quickly reflect the training results. There are also some nutrients that can help the body slow down fatigue and effectively reduce the sports injury caused by fatigue. Therefore, this paper combines core strength training with nutrition intervention to explore the effect of this combined training form on table tennis teaching and training.[6]

METHOD

In this paper, the sophomores of table tennis in a college of physical education were selected. According to the form of random sampling, 30 volunteers were divided into the experimental group and the control group. The study and all the participants were reviewed and approved by Ethics Committee of Qiongtai Normal University (NO.2020QTNUFU45). The basic information of the two groups is shown in Table 1.

The combined training method proposed in this paper is carried out from two aspects: strength training and nutrition intervention. The first is core strength training. As shown in Table 2, three stages of exercise training are completed within 9 weeks, so as to strengthen the improvement of core muscle strength.

Table 3 shows nutrition intervention. It can be seen from table 3 that before the intervention, the caloric intake of students was less than the recommended range, and the carbohydrate content was also lower than the recommended range, but the intake range of protein and fat was higher, which was also related to some wrong dietary views. Some students often choose to eat a large amount of protein and fat in order to maintain their body shape, so as to promote muscle development and better shape their body. However, such a nutritional intake method disrupts the scientific nutritional structure and will bring adverse effects in the long run.

Table 1. Statistics of basic physical conditions of students in the experimental group and the control group (n = 30).

Basic conditions	n	Gender	Average age (y)	average height (cm)	average weight (kg)
test group	15	Male	20.691±1.022	179.994±5.518	76.390±7.882
Control group	15	Male	21.389±0.985	179.058±6.315	74.883±9.194

Table 2. Core strength training methods.

Stage	Training content
The first stage (1-3 weeks)	Yangqiao Ting the hip
	Sipid your elbows and feet support
	Slot -up hand support alternate knees alternately
	Put your elbow and lift your legs
	Push on the tablet palm
The second stage (4-6 weeks)	Lying on your legs
	Hip lying on your knees and hip
	Lying on both ends
	Russian turning
	Set the ankle on your back
Third stage (7-9 weeks)	Swiss ball sitting up
	Shoulder supporting the ball and yangqiao tie the hip
	Straight arms and legs to lift your legs
	Foot support ball push -up
	Kick after the elbow support

This study was divided into experimental group and control group, 15 people in each group. During the 9-week exercise training, the experimental group received nutrition every day according to the food provided by the nutritionist, and conducted one hour of core strength training every Monday, Wednesday and Friday. According to their actual situation, the control group carried out one hour of traditional physical training at the same time every Monday, Wednesday and Friday, without any restriction on dietary intake.

In order to reduce the interference of human factors as much as possible, the students should do the following: first, the students in the experimental group should not eat too much other food during the non eating time, so as to avoid breaking the existing diet structure and affecting the experimental effect. Secondly, the duration of sports training of the two groups of students is basically the same, and there is no additional training in the control group and the experimental group. Third, during the 9-week experiment, the two groups of students did not have any major diseases and did not take drugs.

Before and after the beginning of the experiment, the physical indexes of table tennis students and the comprehensive score of service technology were obtained.

Through the comprehensive analysis of physical and technical aspects, it can be seen that the higher the technical level, the stronger the physical ability, the stronger the instantaneous explosive force and endurance, the better the students can adapt to the changing situation of the field and better grasp the initiative of the field. Therefore, in order to comprehensively analyze the impact of "core strength training + nutrition intervention" on the comprehensive quality of table tennis students' competitive performance, Score the students and record and compare the values.

RESULTS

Effect of "core strength training + nutrition intervention" on physical fitness of table tennis students

This chapter analyzes the physical condition of table tennis students from the three indicators of flat support, grip strength and standing long jump. The specific results are shown in Table 4.

As shown in Table 4, it can be seen from the intra group comparison that the relevant indexes after the experiment are more optimized than

Table 3. Nutrition intervention.

Option	Before	Energy Supply%	After	Energy Supply%	Recommended scope
Calories (kcal)	1812.842±248.266	——	2468.943±269.157	——	2200-3200kcal
Carbohydrate (g)	228.101±43.307	49.345%	348.823±23.734	57.150%	50%-65%
Protein (g)	80.868±8.706	17.465%	95.513±20.246	15.938%	15%-16%
Fat (g)	65.888±7.488	33.191%	74.678±13.540	26.912%	25%-30%

Table 4. Effect of "core strength training + nutrition intervention" on physical fitness of table tennis students.

Option		Before	After	Mean difference	T	P
Tablet support (s)	test group	23.711±3.359	52.697±4.348	26.3242	-22.5653	0.0000
	Control group	24.399±3.466	26.799±3.475	1.7780	-1.0355	0.0524
Grip (kg)	test group	41.228±6.387	46.822±6.484	3.6549	1.6605	0.0339
	Control group	41.995±5.504	45.314±7.237	3.1575	1.8638	0.0285
Standing long jump (m)	test group	2.746±0.477	2.912±0.516	0.0968	1.1516	0.0213
	Control group	2.681±0.504	2.844±0.484	0.0202	1.0639	0.1694

Table 5. Influence of "core strength training + nutrition intervention" on serving skills of table tennis students.

Option		Before	After	Mean difference	T	P
Sending speed (m/s)	test group	100.554±38.672	122.211±29.056	15.4848	1.4412	0.0222
	Control group	103.423±32.343	106.488±32.135	0.5927	0.1626	0.7853
Number of successful serve (times)	test group	12.388±2.420	18.506±2.032	5.4329	-1.6180	0.0261
	Control group	13.105±2.650	15.901±2.242	2.4271	0.5390	0.2803
Serving speed (turn/s)	test group	49.588±7.575	55.519±7.028	4.5487	1.0970	0.0281
	Control group	48.100±8.001	51.270±7.962	0.6068	0.5410	0.4520

those before the experiment in both the experimental group and the control group, which proves that the physical fitness of table tennis students can be improved by carrying out certain physical training. However, the comparison between groups shows that the average difference before and after the experiment in the experimental group is significantly greater than that in the control group, this shows that the model adopted by the experimental group is better than the existing teaching methods for the physical fitness optimization of table tennis students.

Influence of "core strength training + nutrition intervention" on serving skills of table tennis students

For table tennis students, the optimization of service technology can improve their control on the court, so as to obtain more initiative. Therefore, this section analyzes the impact of service technology, as shown in Table 5.

The existing table tennis teaching model can optimize the students' serving speed, the number of successful serving within 30 times, the speed of serving and other indicators, but the effect is slow, which easily leads to the lack of competitiveness of students in the fierce competition and can not achieve better results. The average difference of the scheme proposed by the experimental group on the optimization of the students' serving index is far greater than that of the control group, which indicates that the training method of the experimental group can improve the training efficiency of table tennis students, so it is worth promoting.

Influence of "core strength training + nutrition intervention" on comprehensive score of table tennis students

In the previous article, we have analyzed the impact of "core strength training + nutrition intervention" on the physical fitness and service skills of table tennis students, and combining them is the comprehensive score of students, which also represents the competitive level of students to a certain extent, as shown in Table 6.

It can be seen from Table 6 that the comprehensive score of the experimental group was increased from the (7.355 ± 1.827) points before the training to (9.072 ± 1.992), and the average value difference was 1.2581 points, P <0.05, indicating that there were significant differences. The comprehensive score of the control group was raised from the

Table 6. Effect of "core strength training + nutrition intervention" on comprehensive scores of table tennis students.

Group	Before	After	Mean difference	T	P
Test group	7.355±1.827	9.072±1.992	1.2581	1.7662	0.0172
Control group	7.606±1.937	7.989±1.440	0.1976	0.7897	0.1334

(7.606 ± 1.937) points before the training to (7.989 ± 1.440), and the average value difference was 0.1976 points, P> 0.05, indicating that there was no significant difference. It can be seen that the plan proposed by the experimental group is obvious compared to the control group.

DISCUSSION

Core strength training plays an important role in improving the level of students' table tennis. Through scientific core strength training, students' body control ability can be effectively improved. Help students improve their body stability after lowering the center of gravity. The balance ability of the body is closely related to the activity of the nervous system. Core strength training indirectly improves the activity of the nervous system and enables students to have good reaction ability. The scientific training method is to simulate the different situations of the body in the sports according to the table tennis project. Make good use of balance board, skateboard and other auxiliary equipment. The body may also be suspended for training. These methods are to create an unbalanced and weightless environment for the body. It can truly restore all kinds of situations encountered in the competition. At the same time, we should pay attention to the training of muscle strength. Only with good muscle strength can we complete high-intensity competitive events. In daily training, we should train the muscle groups with core strength. With the help of auxiliary equipment, we should try to adopt the muscle training mode of increasing strength. During daily training, the training plan shall be formulated according to the physical condition of the individual. The training content should also follow the principle of gradual and orderly progress, from simple to complex. The training intensity is from weak to strong. With the improvement of one's level in training, the intensity of training content should be improved. Waist and abdomen strength is an important part of core strength. Scientific strength training for abdominal muscles. Due to the special abdominal muscle group, the fatigue recovery period of the abdominal muscle

group is short. It is recommended to carry out certain training every day. In the training process, we should always pay attention to the training status of students. Avoid high-intensity training under the condition of fatigue and exhaustion, and prevent various sports injuries caused by physical discomfort. For the students in the recovery period, the rehabilitation training plan for the recovery period shall be formulated separately. Students can avoid secondary injury of the injured part while maintaining their athletic state during the injury period. At the same time, coaches should update the advanced training methods in time to make the training mode efficient.

CONCLUSION

How to improve the training efficiency of table tennis students, make them more competitive in the same time, so as to improve their competitive level and achieve better results has been the focus of coaches and physical education teachers. Compared with the current traditional table tennis teaching mode, the scheme proposed in this paper has better sports efficiency and can help students improve their physical quality and sports skills more scientifically, so as to improve the comprehensive level of students and make them more advantageous in the field. Therefore, the mode proposed in this paper is worth promoting in table tennis teaching. Of course, there are some problems in the way of this article. For example, in the aspect of nutrition intervention, the dietitian is used to prepare meals. However, in the long-term practice, it is difficult for students to always maintain a unified eating method. Therefore, in the follow-up teaching process, it is also necessary to strengthen the adjustment of nutrition intervention and improve the nutrition cognition of students, so as to achieve the combination of teachers' guidance and students' self-discipline and jointly promote the improvement of the competitive level of table tennis students.

ACKNOWLEDGEMENTS

The paper is supported by Fund Project: 2021 Jiangsu Provincial University Philosophy and Social Science Research General Project (2021SJA2189).

All authors declare no potential conflict of interest related to this article

AUTHORS' CONTRIBUTIONS: The author has completed the writing of the article or the critical review of its knowledge content. This paper can be used as the final draft of the manuscript. Every author has made an important contribution to this manuscript. Dahui Ma: writing and execution. Zhiyong Fu: data analysis. Dae-Hee Kim: article reviews.

REFERENCES

1. Zhang H, Zhou Z, Yang Q. Match analyses of table tennis in China: a systematic review. J Sports Sci. 2018;36(23):2663-74.
2. Zhang Y, Breedlove J. Sustaining market competitiveness of table tennis in China through the application of digital technology. Sport Soc. 2021;24(10):1770-90.
3. Furjan-Mandić G, Kondrič M, Tušak M, Rausavljević N, Kondrič L. Sports students' motivation for participating in table tennis at the faculty of kinesiology in Zagreb. Int J Table Tennis Sci. 2010;(6):44-7.
4. Guillou J, Durny A. Students' situated action in physical education: analysis of typical concerns and their relations with mobilized knowledge in table tennis. Phys Educ Sport Pedagogy. 2008;13(2):153-69.
5. Terenzio A, Cassera A, Gervasoni A, Pozzi A, Orlando A, Greco A, et al. The Impact of a Nutritional Intervention Program on Eating Behaviors in Italian Athletes. Int J Environ Res Public Health. 2021;18(14):7313.
6. Martinez-Rodriguez A, Leyva-Vela B, Martinez-Garcia A, Nadal-Nicolas Y. Effects of lacto-vegetarian diet and stabilization core exercises on body composition and pain in women with fibromyalgia: randomized controlled trial. Nutr Hosp. 2018;35(2):392-9.