RESISTANCE TRAINING APPLIED TO THE TEACHING OF KUNG FU

TREINAMENTO DE RESISTÊNCIA APLICADO NO ENSINO DE KUNG FU

ENTRENAMIENTO DE RESISTENCIA APLICADO A LA ENSEÑANZA DEL KUNG FU

ORIGINAL ARTICLE
ARTIGO ORIGINAL
ARTÍCULO ORIGINAL

Wu Wenjie[1]
(Physical Education Professional)

1. Suzhou University of Science and Technology, Suzhou, Jiangsu, China.

Correspondence:
Wu Wenjie
Suzhou, Jiangsu, China. 215009.
0481@usts.edu.cn

ABSTRACT

Introduction: Many studies have explored different training methods to improve cardiorespiratory capacity, ensuring better oxygen demand to help students develop better sports skills and teaching outcomes. Objective: Explore the effects of applying resistance training on kung fu teaching. Methods: 40 kung fu athletes were selected as research volunteers. They were randomly divided into experimental and control groups; both were trained in a cardiopulmonary resistance protocol for 8 weeks, three times a week, using a breathing trainer. The control group trained at 20%, while the experimental group had their training at 50% of full capacity. Results: The maximal inspiratory pressure, FEV1 / FVC, and mvv15 of the lung function indices increased significantly in the experimental group; the forced capacity and maximal ventilation of the oxygen uptake capacity indices also increased significantly. The blood oxygen saturation and the blood flow perfusion index of the oxygen utilization capacity indices had significant differences between the groups; the central balance and flexibility indices also showed significant differences. Conclusion: After cardiopulmonary endurance training, the athletes' capacity was significantly improved, inferring a benefit in the quality of kung fu teaching. ***Level of evidence II; Therapeutic studies - investigation of treatment outcomes.***

Keywords: Cardiopulmonary Exercise Test; Physical Fitness; Kung Fu.

RESUMO

Introdução: Muitos estudos têm explorado explorando diferentes métodos de treinamento para melhorar a capacidade cardiorrespiratória, garantindo uma melhor demanda de oxigênio para ajudar os estudantes a desenvolverem melhores habilidades esportivas e resultados do ensino. Objetivo: Explorar os efeitos da aplicação do treinamento de resistência sobre o ensino de kung fu. Métodos: 40 atletas de kung fu foram selecionados como voluntários de pesquisa. Eles foram divididos aleatoriamente em grupo experimental e controle, ambos foram treinados num protocolo de resistência cardiopulmonar durante 8 semanas, três vezes por semana, utilizando um treinador respiratório. O grupo controle treinou a 20% enquanto o experimental teve seu treinamento a 50% de capacidade total. Resultados: A pressão inspiratória máxima, VEF1 / FVC e mvv15 dos índices de função pulmonar aumentou significativamente no grupo experimental, a capacidade forçada e a ventilação máxima dos índices de capacidade de absorção de oxigênio também aumentaram significativamente. A saturação de oxigênio no sangue e o índice de perfusão do fluxo sanguíneo dos índices de capacidade de utilização de oxigênio tiveram diferenças significativas entre os grupos, o equilíbrio central e os índices de flexibilidade também evidenciaram diferenças significativas. Conclusão: Após o treinamento de resistência cardiopulmonar, a capacidade dos atletas foi significativamente aprimorada, inferindo um benefício na qualidade do ensino de kung fu. ***Nível de evidência II; Estudos terapêuticos - investigação dos resultados do tratamento.***

Descritores: *Teste de Esforço Cardiopulmonar; Aptidão Física; Kung Fu.*

RESUMEN

Introducción: Muchos estudios han explorado diferentes métodos de entrenamiento para mejorar la capacidad cardiorrespiratoria, asegurando una mejor demanda de oxígeno para ayudar a los estudiantes a desarrollar mejores habilidades deportivas y resultados de enseñanza. Objetivo: Explorar los efectos de la aplicación del entrenamiento de resistencia en la enseñanza del kung fu. Métodos: Se seleccionaron 40 atletas de kung fu como voluntarios para la investigación. Se dividieron aleatoriamente en grupo experimental y grupo de control, ambos fueron entrenados en un protocolo de resistencia cardiopulmonar durante 8 semanas, tres veces por semana, utilizando un entrenador de respiración. El grupo de control entrenó al 20% mientras que el grupo experimental lo hizo al 50% de su capacidad. Resultados: La presión inspiratoria máxima, VEF1 / FVC y mvv15 de los índices de función pulmonar aumentaron significativamente en el grupo experimental, la capacidad forzada y la ventilación máxima de los índices de capacidad de captación de oxígeno también aumentaron significativamente. La saturación de oxígeno en sangre y el índice de perfusión del flujo sanguíneo de los índices de capacidad de utilización de oxígeno presentaron diferencias significativas entre los grupos, los índices de equilibrio central y de flexibilidad también mostraron diferencias significativas. Conclusión: Tras

CC BY NC

el entrenamiento de resistencia cardiopulmonar, la capacidad de los atletas mejoró significativamente, lo que infiere un beneficio en la calidad de la enseñanza del kung fu. ***Nivel de evidencia II; Estudios terapéuticos - investigación de los resultados del tratamiento.***

Descriptores: *Prueba de Esfuerzo Cardiopulmonar; Aptitud Física; Kung Fu.*

DOI: http://dx.doi.org/10.1590/1517-8692202329012022_0540 Article received on 09/21/2022 accepted on 10/21/2022

INTRODUCTION

As one of the traditional cultural heritages of China, traditional Wushu not only contains many different forms of exercise methods and sports skills, but also has become a comprehensive sports activity integrating fitness and entertainment after a long period of development, evolution and accumulation.[1] It is understood that so far, martial arts teaching items in many schools are only taught as elective contents in the course classification. At the same time, although most of the domestic colleges and universities have set up the teaching project of Wushu in the physical education teaching plan, most of the current teaching materials are not suitable for the martial arts teaching in class, and the teaching content also presents unscientific and incomplete phenomena and problems.[2] In the teaching of traditional martial arts, teachers play the main teaching role and are in the active position of teaching, teaching martial arts actions and skills to students. While the students are in a passive acceptance position, mainly through imitating the teacher's actions to learn martial arts.[3] There is a one-way relationship between the teacher and the students, and the teaching content is single, not paying attention to heart and lung resistance training and core ability training. Therefore, the students' subjective initiative and the naturalness of action cannot be well developed. On the whole, the teaching effect of Wushu is not as good as expected.[4] During the practice of Wushu, each movement system of the human body is participating in different degrees. Different movement modes have different requirements for muscle contraction and relaxation, the overall control of different movement postures, and the stability of abdominal and rib muscles. For martial arts, scientific training, overall participation and flexible adjustment of breathing muscles are very important. Practicing breathing can help improve the strength of core and auxiliary muscles while generating basic strength.[5] If the rhythm and amplitude of breathing are not well controlled, it will often lead to improper posture and risk of injury. "Chaqi" is a form of tingling that often occurs during exercise. Some theories believe that it is caused by the ischemia or spasm (cramp) of the diaphragm. Compared with other training, cardiopulmonary resistance training is a training method with strong pertinence, the shortest time and the least energy consumption, which can effectively improve the human body's cardiopulmonary ability and various quality indicators of core strength.[6] To study how to improve the comprehensive quality of students' Cardiopulmonary ability by using cardiopulmonary resistance training is the only way for the sustainable and innovative development of Wushu in the new era.[7] In order to improve the level of Wushu teaching and realize the benign reform of teaching, this paper takes the Wushu movement of a certain school as the main research object. In the research process, the field investigation method, literature collection method and experimental method are mainly used, and a series of teaching experiments are carried out in the practice of heart lung resistance training.

METHOD

The experimental object of this paper is to select 40 Wushu athletes from a school, and divide all the subjects into the experimental group and the control group by random allocation. The study and all the participants were reviewed and approved by Ethics Committee of Suzhou University of Science and Technology (NO.2018SZUST-RG). All the subjects in this study have good physical health, no disease history, no clear disease diagnosis, no metabolic disorder and other problems. All subjects voluntarily participated in this study and were able to actively cooperate with the experimental training. See Table 1 for the basic information of the subjects.

Both the experimental group and the control group received 8 weeks of cardiopulmonary resistance training, three times a week, using a breathing trainer. The experimental scheme is as follows:

Experimental group: two groups of training were carried out each time. One group was trained for 30 times in total, with an interval of 4 minutes between each group and a training load of 50% MIP; Control group: one group of training was carried out each time, and the other group was trained for 30 times. The training interval of each group was 4 minutes, and the training load of 20% MIP was taken.

RESULTS

Pulmonary function index test results

After cardiopulmonary resistance training for the subjects of the experimental group and the control group, it can be seen from Table 2 that the maximum inspiratory pressure of the experimental group after training has a significant increase ($P < 0.01$), the MIP before the experiment is 144.80 ± 16.758 (cmH_2O), and the MIP after the experiment is 170.39 ± 15.742 (cmH_2O), with significant difference.

It can be seen from the comparison of pulmonary function index results of subjects in the experimental group and the control group in Table 3 that FEV1 / FVC and mvv15 in the experimental group increased after cardiopulmonary resistance training, among which FEV1 / FVC was 82.50 ± 17.150 (%) before the experiment and 94.72 ± 7.193 (%) after the experiment, with a significant increase ($P < 0.05$). Mvv15 was 171.42 ± 35.718 (L / min) before the experiment and 193.12 ± 32.286 (L / min) after the experiment, $P < 0.01$, with a very significant difference.

Oxygen uptake and utilization index test results

It can be seen from the comparison of the results of the oxygen uptake ability of the subjects in Table 4 that the forced vital capacity and the maximum ventilation of the experimental group have significantly increased after a period of cardiopulmonary resistance training. Among them, the forced vital capacity is 1.98 ± 0.410 (L) before the experiment and 2.44 ± 0.290 (L) after the experiment, $P < 0.01$, with a very significant

Table 1. Basic information of subjects.

Basic situation	Test group	Control group
Age	20.45±0.637	21.26±0.796
Height (cm)	183.43±2.379	180.39±1.433
Weight (kg)	71.47±6.450	64.79±6.769
Training period (year)	8.50±0.478	8.91±0.319

Table 2. Test results of MIP (cmH_2O) of experimental subjects.

Test indicators	Test Group		Control Group	
	Before	After	Before	After
MIP	144.80±16.758	170.39±15.742**	140.25±22.134	142.58±18.082

* represents $P < 0.05$, ** represents $P < 0.01$.

Table 3. Test results of lung function indexes.

Test indicators	Test Group		Control Group	
	Before	After	Before	After
SVC (L)	5.87±1.078	5.99±0.549	5.53±0.728	5.55±0.818
FVE (L)	4.78±0.658	5.04±1.097	4.66±0.658	4.33±0.329
FEV1 (L)	3.90±1.107	4.69±0.968	3.54±0.469	3.56±0.399
FEV1/FVC(%)	82.50±17.150	94.72±7.193*	77.19±7.064	83.25±7.882
MVV_{15} (L/min)	171.42±35.718	193.12±32.286**	136.17±17.091	156.79±20.193**

*represents P < 0.05, ** represents P < 0.01.

Table 4. Test results of oxygen uptake capacity index.

Measurement standard	Test Group		Control Group	
	Before	After	Before	After
Volual volume of lungs (L)	1.98±0.410	2.44±0.290**	2.04±0.480	2.39±0.390*
Volidation (L)	2.6±0.710	2.62±0.660	2.57±0.730	3.11±0.550
Maximum Venture (L/Min)	57.27±17.803	69.61±14.634**	61.01±5.068	73.01±19.172
Breathing capacity for one second (L/S)	1.88±0.420	2.08±0.190	1.83±0.480	2.16±0.290
Divine breathing volume occupancy for one second (%)	95.31±9.886	86.23±11.106	89.91±9.716	91.57±9.386

* represents P < 0.05, ** represents P < 0.01.

difference. The maximum ventilation is 57.27 ± 17.803 (L) before the experiment and 69.61 ± 14.634 (L) after the experiment, P < 0.01, The P values of vital capacity, forced breathing volume in one second and the ratio of forced breathing volume in one second to forced vital capacity were all greater than 0.05, which was not statistically significant.

It can be seen from the comparison of the data of the oxygen utilization ability of the subjects in Table 5 that after the cardiopulmonary resistance training, the blood oxygen saturation and blood flow perfusion index of the experimental group have statistical significance, in which the blood oxygen saturation before the experiment is 99.52 ± 0.624 (%), and the blood oxygen saturation after the experiment is 98.17 ± 0.445 (%), P < 0.01, with very significant difference. The blood flow perfusion index of the experimental group before the experiment was 5.11 ± 1.762 (%), and the blood flow perfusion index after the experiment was 6.35 ± 1.356 (%), P < 0.01. There was also a very significant difference.

Core balance and toughness index test results

Through the comparison of core balance and flexibility index data in Table 6, it can be seen that after training, the index of standing with eyes closed and one foot in the experimental group has a very significant increase (P < 0.01), and trunk flexion and extension have no statistical significance, but the value has increased. There was also significant difference in the indexes of standing with eyes closed and one foot in the control group, and there was no significant difference in trunk flexion and extension.

DISCUSSION

The data changes before and after the experiment show that the core balance ability of the two groups of athletes has been effectively improved. Through the specific analysis of the data, it can be seen that there is a significant difference between the experimental group and the control group in the performance of standing with eyes closed and one foot. The performance of the experimental group after the intervention is more obvious than that before the intervention, which indicates that the effect of cardiopulmonary resistance training on improving the core balance level is more significant. In terms of core flexibility, there is no significant difference between the data before and after the experiment and the results of the two groups after the experiment. Therefore, we can know that resistance training has little impact on the core flexibility level of athletes.

Table 5. Oxygen utilization index test results.

Measurement standard	Test Group		Control Group	
	Before	After	Before	After
Saturation (%) blood oxygen saturation (%)	99.52±0.624	98.17±0.445**	99.32±1.069	99.12±1.237
Hemoglobin (G/DL)	12.94±0.802	12.89±0.891	12.54±0.742	12.74±0.663
Blood flow irrigation index (%)	5.11±1.762	6.35±1.356**	5.39±1.465	5.34±1.257

*represents P < 0.05, * * represents P < 0.01.

Table 6. Core balance and flexibility index results.

Measurement standard	Test Group		Control Group	
	Before	After	Before	After
Close your eyes with one foot standing	29.96±2.281	35.25±2.898**	30.67±2.818	31.24±2.868*
Trunk flexion	18.03±0.627	18.12±0.568	17.68±0.837	17.78±0.876

*represents P < 0.05, ** represents P < 0.01.

Therefore, in the process of daily teaching, teachers should pay attention to the change of teaching ideas. In addition to strengthening the awareness of breathing ability training in teaching, they should also have the awareness of training core deep muscles. They should not ignore one thing and lose another and forget the conventional core toughness training. Therefore, scientific and comprehensive training should be carried out to make core Toughness Training and cardiopulmonary resistance training work together and organically combine them to achieve dynamic balance. During the actual cardiopulmonary resistance training, teachers should also pay attention to leading students to carry out detailed training in core muscle tightening, breathing and movement coordination, and timely stretching after training. At the same time, it is also necessary to fully consider the actual physical characteristics and training degree of the students, formulate targeted training plans for students in different stages according to scientific training methods and the principle of gradual and orderly progress, and gradually improve the complexity of the training actions and the corresponding training intensity.

CONCLUSION

The basic movement mode of Wushu practice is a combination of "adjusting the heart", "adjusting the breath" and "adjusting the body". It has a comprehensive and all-round characteristic movement concept that integrates the heart, Qi and body. The traditional martial arts combine the skeletal muscle and breath breath breathing method to exercise the cardiopulmonary system in the invisible, and achieves the effect of improving the cardiopulmonary function between the visible and the invisible. Therefore, the sports effect can be maximized. Therefore, in the training of Wushu, the students' Cardiopulmonary ability has also been improved. Through cardiopulmonary resistance training, the cardiopulmonary ability and balance of students majoring in martial arts have been improved, which can effectively improve the teaching quality of martial arts, and provide a reference for further exploring the application of martial arts teaching.

ACKNOWLEDGEMENT

This paper was supported by (1) Project of the National Social Science Fund of China "Research on the Image of International Communication of Chinese Martial Arts" (No.15BTY093); (2) The Postdoctoral program of Cambridge University funded by China Scholarship Council(-No.201708515016); (3) Shandong social science planning and research project: Research on the Inheritance and Development of Shandong Folk Martial Art (No.15CTYJ11).

The author 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. Wu Wenjie: writing and execution.

REFERENCES

1. Guo Y, Qiu P, Liu T. Tai Ji Quan: an overview of its history, health benefits, and cultural value. J Sport Health Sci. 2014;3(1):3-8.
2. An H. Thoughts on Skill Transmission and Cultural Inheritance of Wushu Teaching in Colleges and Universities. In: 6th International Conference on Humanities and Social Science Research. 2020:69-72. Atlantis Press.
3. Bai ZG. Wushu teaching strategy and development in urban and rural schools. Eurasia J Math Sci Technol Educ. 2017;13(12):7791-7.
4. Feigenbaum MS, Pollock ML. Prescription of resistance training for health and disease. Med Sci Sports Exerc. 1999;31(1):38-45.
5. Bohannon RW. Muscle strength and muscle training after stroke. J Rehabil Med. 2007;39(1):14-20.
6. Earp JE, Hatfield DL, Downing S. The cardiovascular, cardiopulmonary and metabolic demands of a simulated snowboard cross competition–An exploratory case study. J Phys Educ Sport. 2021;21(Suppl 6):3305-12.
7. Petrofsky JS, Cuneo M, Dial R, Pawley AK, Hill J. Core strengthening and balance in the geriatric population. Journal of Applied Research in Clinical and Experimental Therapeutics. 2005;5(3):423-33.