WHIOCE PUBLISHING PTE. LTD.
PROVIDING FIRST-CLASS SCIENTIFIC INFORMATION FOR TOP SCHOLARS

2025,Volume 10, Issue 2
Advances in Precision Medicine
Online ISSN: 2424-9106
Print ISSN: 2424-8592

Rehabilitation Effect of Aerobic Resistance Rehabilitation Therapy Combined with Respiratory Exercise Rehabilitation in Patients with Chronic Obstructive Pulmonary Disease

Xiaomin Si*
Taihe Hospital Affiliated Hospital of Hubei University of Medicine, Shiyan 442000, Hubei, China
**Author to whom correspondence should be addressed.*

Abstract: *Objective:* To analyze the effect of aerobic resistance and respiratory exercise rehabilitation therapy on COPD patients. *Methods:* 80 patients with COPD admitted to the hospital from January 2022 to December 2023 were randomly divided into an observation group and a control group, and underwent conventional rehabilitation therapy and aerobic COPD rehabilitation therapy and respiratory exercise rehabilitation therapy, respectively. Rehabilitation status was assessed in both groups. *Results:* After treatment, the observation group improved significantly, better than the control group, $P < 0.05$. Before treatment, the longest distance was within 6 minutes, $P > 0.05$. After treatment, the observation group had a longer walking distance than the control group, $P < 0.05$. Before treatment, the indices such as partial oxygen and blood pressure in the observation group were comparable, with $P > 0.05$. After treatment, the blood gas index improved significantly in the observation group, better than the control group, $P < 0.05$. *Conclusion:* During the treatment of patients with COPD, while guiding patients to carry out aerobic resistance pulmonary rehabilitation training, the implementation of respiratory exercise rehabilitation measures can effectively improve the pulmonary function index of patients, improve their exercise endurance, and improve the arterial oxygen partial pressure level of patients.

Keywords: Aerobic resistance rehabilitation therapy; Respiratory exercise rehabilitation; Chronic obstructive pulmonary disease; Rehabilitation effect

Online publication: June 28, 2025

1. Introduction

The production of COPD will restrict the air flow of the respiratory tract to some extent, leading to symptoms such as dyspnea and cough. With the progression of the disease, it may cause respiratory failure and pose a great threat to the life safety of patients. The development of conventional rehabilitation treatment will guide patients to carry out respiratory rehabilitation training. Although it can improve the respiratory function and relieve the clinical symptoms

of patients, the recovery rate involved is relatively slow, which puts forward higher requirements for the optimization of rehabilitation treatment measures [1]. The application of aerobic resistance pulmonary rehabilitation therapy will combine the actual condition of patients, consider the treatment needs of patients, and develop a relatively standard aerobic resistance training plan to improve the lung function of patients. The development of respiratory exercise rehabilitation therapy will improve the prognosis level of patients with [2,3] through diversified exercise training programs. In this study, the application effect of aerobic antipulmonary rehabilitation therapy combined with respiratory exercise rehabilitation therapy was analyzed to promote the improvement of rehabilitation treatment programs for patients with COPD.

2. Data and methods

2.1. General information

In this study, 80 patients with COPD admitted to the hospital from January 2022 to December 2023 were randomly divided into an observation group and a control group. In the observation group, 21 males and 19 females, aged 63.54 ± 4.57 years old, with a disease duration of 3.48 ± 1.02 years. The control group included 22 males and 18 females, aged 63.48 ± 4.55 years old, with a disease duration of 3.52 ± 1.01 years. Comparative analysis of the two data groups, $P > 0.05$.

Inclusion criteria: (1) Patients who meet the diagnostic criteria for COPD guidelines for the Diagnosis and Treatment of Integrated Traditional Chinese and Western Medicine (2022 edition) [4]; (2) Patients without any other respiratory diseases were included. Exclusion criteria: (1) Patients with other respiratory diseases; (2) Patients with complicated cancer diseases were excluded.

2.2. Methods

2.2.1. Treatment methods in the control group

Routine rehabilitation treatment measures were adopted. Implement routine health education, inform patients of the key points and precautions of rehabilitation treatment, guide patients to receive rehabilitation treatment, such as respiratory exercise rehabilitation training, guide patients to carry out aerobic exercise, such as walking and aerobic aerobics, and allow patients to adjust the exercise frequency and intensity [5–7] according to their own recovery status and tolerance. In the process of breathing training, it mainly involves lip contraction breathing training and abdominal breathing training, to improve the recovery level of the patient's respiratory function [8].

2.2.2. Treatment method of the observation group

Based on the aerobic pulmonary rehabilitation therapy, respiratory exercise rehabilitation therapy is applied:

(1) Build a rehabilitation treatment team

Team members involved in the number of relatively more, type is relatively complex, such as department director, psychological consultant, nutrition physicians and rehabilitation technicians, etc., combined with patients treatment requirements, rehabilitation strategy, the functions of team members, such as director of the department play their overall coordination utility, nursing staff to carry out the rehabilitation interventions, rehabilitation physicians to guide patients training, standardize workflow, supervise rehabilitation work, regular discussion work, in-depth analysis of the advantages and disadvantages of rehabilitation treatment, promote the optimization of

rehabilitation exercise measures [9].

(2) Implement aerobic resistance to the pulmonary rehabilitation treatment strategy

First of all, during the breathing training, the patient can be informed to breathe in through the nose, breathe deeply, and keep breathing slowly for four seconds. When inhaling, put your hand on your abdomen to feel the fluctuation of the abdomen, and breathe repeatedly. The training time is about 15 minutes, and the training frequency is three times a day [10]. Secondly, in the process of aerobic training, it is necessary to analyze the clinical symptoms, consider the patient's tolerance, guide patients to carry out aerobic exercise, such as walking, and monitor the blood pressure and heart rate. Once the patient has symptoms such as shortness of breath, the patient should stop exercising in time to maintain the patient's life safety of the patient. Finally, in the process of resistance training, the maximum exercise load of the target muscle group was detected, and the exercise intensity was gradually improved. The compound trainer of hands and feet was used to improve the training effect of the patient. The training time was about 30 minutes, and the training frequency was twice a day [11].

(3) Improve the level of respiratory exercise rehabilitation training

Medical staff need to evaluate the patients vital signs indicators, confirm the patient life is stable, guide patients to carry out abdominal breathing training, told patients to adjust their position for supine position, will be the hand in the abdomen, autonomous deep breathing, make patients in a relaxed state, after patients need to deep inhalation, improve the level of abdominal expansion, keep the patient chest motionless, slowly exhaled after five seconds. During the lip contraction breathing training, the patient should be informed to breathe out [12] for 5 seconds. Secondly, the patient can carry out the upper limb circle activities to exercise the patient's limb function. Finally, in the process of breathing exercise, the patient can be assisted to straighten the patient's arm and raise their hands to produce an obvious sense of pulling. At the same time of raising both hands, appropriately expand the spacing between the legs, and the body forward to improve the patient's chest training level [13]. In addition, it lets the patient back against the wall with a relatively slow speed squat, the thigh parallel to the ground after the slow rise.

2.3. Observation of indicators

(1) Pulmonary function indicators, such as forced expiratory volume in the first second.

(2) Patient exercise endurance was measured by the 6-minute walking distance test.

(3) The blood gas analyzer was used to assess the partial oxygen pressure, oxygen saturation and carbon dioxide partial pressure level before and after treatment.

2.4. Statistical treatment

In this study, SPSS 23.0 was used for data processing and count data line χ^2 test. Measurement data line t test. If P <0.05, there is a statistical difference between the data.

3. Results

3.1. Index of pulmonary function

According to **Table 1**, after treatment, the observed group improved the lung function indicators significantly, which was better than that of the control group, with $P < 0.05$.

Table 1. Index of pulmonary function before and after treatment in both groups (mean ± SD)

Group	Example number	FEV1 (L)		FVC (L)		MMEF (L/s)		FEV1/FVC (%)	
		Prethera py	Post-treatment	Prethera py	Post-treatment	Prethera py	Post-treatment	Prethera py	Post-treatment
Observ ation group	40	1.24 ± 0.21	2.81 ± 0.53	2.27 ± 0.46	3.36 ± 0.54	0.91 ± 0.26	2.35 ± 0.46	54.62 ± 3.14	85.42 ± 3.35
Control group	40	1.32 ± 0.15	1.97 ± 0.63	2.31 ± 0.52	2.71 ± 0.57	0.93 ± 0.24	1.87 ± 0.47	54.57 ± 3.18	74.02 ± 3.69
t	-	1.331	6.634	1.523	7.538	1.126	8.458	0.762	10.387
P	-	0.173	0.026	0.156	0.018	0.274	0.009	0.441	0.001

3.2. Changes in exercise endurance

According to **Table 2**, the longest walking distance within 6 minutes, $P > 0.05$. After treatment, the observation group had a longer walking distance than the control group, $P < 0.05$.

Table 2. Changes in exercise endurance before and after treatment in the two groups (mean ± SD)

Group	Example number	Pretherapy	2 weeks after treatment	4 weeks after treatment	8 weeks after treatment
Observation group	40	302.68 ± 4.85	324.96 ± 5.24	335.75 ± 5.84	370.02 ± 4.05
Control group	40	303.02 ± 3.54	309.52 ± 4.87	314.25 ± 4.81	334.76 ± 3.27
t	-	0.513	10.367	11.854	12.534
P	-	0.608	0.001	0.001	0.001

3.3. Blood gas level

According to **Table 3**, before treatment, blood oxygen partial pressure in the observation group were comparable, $P > 0.05$. After treatment, the blood gas index improved significantly in the observation group, better than the control group, $P < 0.05$.

Table 3. Blood gas levels before and after treatment in the two groups (mean ± SD)

Group	Example number	PaO_2 (mmHg)		SaO_2 (%)		$PaCO_2$ (mmHg)	
		Pretherapy	Post-treatment	Pretherapy	Post-treatment	Pretherapy	Pretherapy
Control group	40	82.67 ± 2.11	95.68 ± 2.03	71.38 ± 8.41	96.62 ± 2.18	55.84 ± 2.17	33.57 ± 1.65
Observatio	40	82.72 ± 2.08	88.14 ± 2.17	71.47 ± 8.37	87.34 ± 3.51	55.89 ± 2.14	43.02 ± 1.68

n group							
t	-	1.621	12.576	0.867	9.537	0.196	10.876
P	-	0.109	0.001	0.394	0.001	0.846	0.001

4. Discussion

At present, due to the environmental climate and other factors, the prevalence of COPD continues to increase, which affects the health of the middle-aged and elderly groups. This disease is relatively difficult to cure, showing the characteristics of repeated attacks, damaging the lung function of patients, reducing the exercise endurance of patients, and restricting the improvement of patients' quality of life [14]. The application of aerobic resistance pulmonary rehabilitation therapy will evaluate the lung function of the patients, adjust the adjustment of the rehabilitation training plan, improve the scientific training, and reduce the impairment of the patients' lung function. The development of respiratory exercise rehabilitation training will exercise the respiratory function, improve the tracheal compliance and adopt different training methods to improve the ventilation function.

The results of this study showed that lung function indexes improved significantly and exercise endurance increased significantly in the observation group after treatment. The reason may be that the respiratory exercise rehabilitation training will guide the patients' abdominal breathing and lip contraction breathing training based on the patient's actual condition, supplemented by limb training, to enhance the patient's exercise endurance and improve the patient's respiratory function. At the same time, continuous aerobic exercise training, such as walking, can effectively improve their muscle endurance and oxygen carrying capacity, improve their lung function recovery level, make patients consume more oxygen, and improve their vital capacity [15].

Through this study, it was found that blood oxygen partial pressure improved significantly after treatment. Analysis of the reasons may also be for the development of aerobic resistance pulmonary rehabilitation treatment, through a scientific exercise training program, such as aerobics, improve the muscle function, improve the skeletal muscle oxidation ability, and reduce the symptoms such as dyspnea. Generally speaking, patients with COPD are often accompanied by skeletal muscle dysfunction, which reduces the activity of patients, causes muscle fiber atrophy, and affects patients' respiratory and limb function. And aerobic resistance pulmonary rehabilitation therapy and respiratory exercise rehabilitation therapy, will consider the actual condition, guide patients to carry out respiratory and limb function training, improve the level of thoracic activity, improve muscle coordination, correct patients with abnormal breathing, improve patients with movement function, improve patients blood gas analysis indicators [16].

5. Conclusion

To sum up, in the rehabilitation process of patients with COPD, the use of respiratory exercise rehabilitation therapy based on aerobic COPD rehabilitation therapy can effectively improve their lung function and improve their exercise endurance.

Funding

Scientific Research Project of Taihe Hospital, "Study on the Efficacy of Fiberoptic Bronchoscope Pulmonary Lavage

Combined with Pulmonary Rehabilitation Training in the Treatment of Pulmonary Infection in Patients with Tracheotomy after Stroke" (Project No.: 2020JJXM113)

Disclosure statement

The authors declare no conflict of interest.

References

[1] Zhuang X, Wei M, Liu C, et al., 2024, Effect of Respiratory Exercise Rehabilitation Therapy on Pulmonary Exercise Endurance and Quality of Life in Patients with Stable Chronic Obstructive Pulmonary Disease. Grassroots Medical Forum, 28(31): 48–50 + 56.

[2] Guo L, Ye Z, 2024, Effect of Intensive Pulmonary Rehabilitation Combined with Aerobic Exercise on Sleep Quality in Elderly Patients with Chronic Obstructive Pulmonary Disease. World Journal of Sleep Medicine, 11(7): 1497–1500.

[3] Zhang F, Han S, Su Q, et al., 2024, Effect of Respiratory Exercise Rehabilitation Care Based on Self-Transcendence Theory on Lung Function in Patients with Chronic Obstructive Pulmonary Disease. Integrated Traditional Chinese and Western Medicine Nursing (Chinese and English), 10(5): 156–158.

[4] Zhang H, Tang H, Yu S, Shi Y, Yang X, Zeng P, 2024, Effect of Reduced Lip Abdominal Breathing Combined with Aerobic Resistance Exercise Training in Patients Undergoing Pulmonary Rehabilitation for Chronic Obstructive Pulmonary Disease. Journal of North China University (Natural Science Edition), 25(3): 375–380.

[5] Zhuang H, 2024, Effect of Empowerment Incentive Education Nursing Combined with Respiratory Exercise Rehabilitation Training in Patients with Stable Chronic Obstructive Pulmonary Disease. Reflexology and Rehabilitation Medicine, 5(4): 134–137.

[6] Zhao P, Li N, 2023, Effect of Pulmonary Rehabilitation Exercise Combined with Aerobic Exercise in Patients with Stable Chronic Obstructive Pulmonary Disease. National Health Medicine, 35(5): 181–183.

[7] Chi F, Ge X, Xiao H, et al., 2022, Effect of Baduanjin and Aerobic Exercise Training on Pulmonary Rehabilitation Effect and Immune Function in Patients with Stable Chronic Obstructive Pulmonary Disease. Guangdong Medicine, 43(12): 1518–1522.

[8] Peng X, Ou P, Yang Y, Song Z, 2022, Effect of Advanced Resistance Exercise Combined With Aerobic Exercise on the Effect of Respiratory Rehabilitation in Patients with Stable Chronic Obstructive Pulmonary Disease. International Journal of Geriatrics, 43(4): 429–433.

[9] Wang Y, Chang B, Wang G, 2022, Effect of an Aerobic Training Protocol for Pulmonary Rehabilitation Based on Patient Tolerance on Pulmonary Ventilation and Exercise Endurance in Elderly Patients with Mild to Moderate Stable Chronic Obstructive Pulmonary Disease. Henan Medical Research, 31(9): 1701–1704.

[10] Zhou S, Lu C, 2021, Effect of Respiratory Exercise Rehabilitation Pathway on Self-Care Ability and Exercise Endurance in Patients with Chronic Obstructive Pulmonary Disease. Journal of Chronic Diseases, 22(9): 1382–1384.

[11] Zhao Q, 2021, Effect of Nursing Intervention Based on Respiratory Exercise on Lung Function and Exercise Capacity in Patients with Chronic Obstructive Pulmonary Disease. Famous Doctor, 2021(2): 128–129.

[12] Han T, 2020, Effect of Respiratory Exercise on Lung Function and Exercise Capacity in Patients with Chronic Obstructive Pulmonary Disease. Henan Medical Research, 29(30): 5747–5748.

[13] Wang X, 2020, Application of Respiratory Exercise Rehabilitation Care in Self-Care and Lung Function in Patients

with Chronic Obstructive Pulmonary Disease. Chinese Drug and Clinical, 20(19): 3337–3339.

[14] Wang Q, Lu H, Zheng W, Fan X, 2020, Analysis of Respiratory Exercise on Improving Ventilatory Function and Exercise Tolerance in COPD Patients. South China Preventive Medicine, 46(3): 303–305.

[15] Huang C, 2020, Analysis of the Clinical Effects of Respiratory Exercise Training Combined with Xinbiduo Inhaler for Chronic Obstructive Pulmonary Disease. China, 10(9): 232–235.

[16] Bian B, 2020, Effect of Respiratory Exercise Rehabilitation Pathway on Lung Function and Quality of Life in Non-Invasive Ventilator Treatment in Patients with Chronic Obstructive Pulmonary Disease. Medical Equipment, 33(1): 194–196.