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Clinical Observation of TCM Pulmonary Rehabilitation for Moderate-to-Severe Chronic Obstructive Pulmonary Disease Complicated with Anxiety

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Abstract

Objective: To investigate the clinical efficacy of traditional Chinese medicine (TCM) pulmonary rehabilitation in patients with moderate-to-severe chronic obstructive pulmonary disease (COPD) complicated with anxiety. *Methods:* Ninety patients with moderate-to-severe stable COPD were randomly divided into a control group (n=45) and an experimental group (n=45). The control group received conventional therapy, while the experimental group was additionally treated with TCM pulmonary rehabilitation, including Tai Chi and Liuzijue. Outcomes were assessed using the Hamilton Anxiety Scale (HAMA), modified Medical Research Council (mMRC) dyspnea scale, and COPD Assessment Test (CAT). *Results:* At 3-month follow-up, the experimental group showed significant improvements in HAMA, mMRC, and CAT scores compared to baseline (all $P < 0.05$). After 6 months, both groups exhibited further improvements in all outcomes (all $P < 0.05$), with the experimental group demonstrating superior efficacy in HAMA, mMRC, and CAT scores compared to the control group (all $P < 0.05$). *Conclusion:* TCM pulmonary rehabilitation significantly alleviates anxiety and respiratory symptoms in patients with moderate-to-severe COPD, highlighting its potential as a complementary therapeutic strategy.

Keywords

Tai Chi

Liuzijue

Pulmonary rehabilitation

Chronic obstructive pulmonary disease (COPD)

Anxiety

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1. Introduction

Chronic obstructive pulmonary disease (COPD), a chronic inflammatory disease characterized by not fully reversible persistent airflow limitation, often coexists with other conditions such as osteoporosis, cardiovascular diseases, anxiety, and depression, severely affecting the quality of life of patients and increasing their burden of medical care [1–2]. Studies have shown that over 40% of COPD patients experience anxiety and other emotional disorders, forming a vicious cycle of "dyspnea—limited physical activity—worsening psychological symptoms", significantly increasing the risk of acute exacerbations and reducing the quality of life [3]. Although the Global Initiative for Chronic Obstructive Lung Disease (GOLD) guidelines recommend the use of anxiolytic drugs in combination with pulmonary rehabilitation as a comprehensive intervention, long-term pharmacological treatment may carry potential risks such as respiratory depression and addiction [4]. Moreover, traditional pulmonary rehabilitation programs have limitations in improving the psychological status of patients. In this context, Traditional Chinese Medicine (TCM)-based pulmonary rehabilitation shows unique potential with its characteristic of "harmonizing both the body and mind." Tai Chi, characterized by gentle physical movements and regulated breathing, has been shown to improve pulmonary ventilation and alleviate anxiety. The Liuzijue combines specific sounds with controlled breathing techniques to regulate the ascending/descending movement of Qi, promote phlegm expulsion, and calm the mind and spirit. In this study, the authors observed the effects of Tai Chi and the Liuzijue on COPD patients with comorbid anxiety, and provided new insights into the development of individualized pulmonary rehabilitation strategies combining both Chinese and Western medicine.

2. Data and methods

2.1. General data

A randomized controlled trial (RCT) design was employed in this study. From June 2023 to June 2024, 90 outpatients with moderate-to-severe stable COPD were recruited from the Integrated Traditional Chinese and Western Medicine Department of Zigong First People's Hospital and were randomly assigned in a 1:1 ratio to either the control group or the experimental group (45 patients each). After excluding dropouts, a total of 79 cases were included in the final analysis (control group: n=40, experimental group: n=39). This study was approved by the Ethics Committee of Zigong First People's Hospital (Approval No: 2023120), complied with the Declaration of Helsinki, and written informed consent was obtained from all participants.

2.2. Diagnostic criteria

Participants who met the diagnostic criteria for COPD in GOLD guidelines (including a post-bronchodilator FEV_1/FVC ratio<70% and 30%≤FEV_1% predicted<80%, corresponding to GOLD stages 2–3); those who were in a clinically stable phase (with no acute exacerbations in the past 4 weeks); those who met the diagnostic criteria for anxiety disorder according to the Chinese Classification and Diagnostic Criteria of Mental Disorders (CCMD-3).

3. Inclusion and exclusion criteria

3.1. Inclusion criteria

Participants who met the diagnostic criteria for GOLD stages 2–3; those who met the diagnostic criteria for anxiety disorder, with a Hamilton Anxiety Rating Scale (HAMA) score ≥14; provided written informed consent, and were willing to cooperate with follow-up.

3.2. Exclusion criteria

Participants with acute exacerbation of COPD; comorbid severe cardiovascular, pulmonary, neurological, hepatic, or renal diseases (e.g., malignancies, cerebral infarction) or other mental disorders; those with speech/cognitive impairments who cannot complete assessments. Dropout criteria: Those who showed poor adherence, developed serious complications or clinical deterioration during the study, or withdrew voluntarily.

4. Therapeutic methods

4.1. Control group

1) Health education: Patients and their families were educated on COPD management using instructional manuals and videos, including indications for oxygen therapy (SaO2≤90%, low-flow oxygen at 1–2 L/min),

smoking cessation advice, medication adherence and self-administered pulmonary rehabilitation (pursed-lip breathing, diaphragmatic breathing, fast/slow walking or calisthenics (30 minutes/session, 1–2 times/day); 2) Medication: Long-acting β2-agonists (LABA), inhaled corticosteroids (ICS) and long-acting muscarinic antagonists (LAMA) were used alone or in combination according to the severity of disease; 3) Follow-up: Participants were followed up by phone once a month to monitor their adherence of medication and rehabilitation trainings.

4.2. Experimental group

The experimental group was given TCM pulmonary rehabilitation, based on the treatment of the control group: 1)Tai Chi: During the first week, patients were guided by a TCM nurse on the spot using a teaching video for Simplified 24-Form Tai Chi. Training was performed 1–2 times a day, with each session lasting 20–30 minutes (heart rate increase<20 beats/min, respiratory rate increase<5 breaths/min). Family members accompanied the patients to monitor for any adverse reactions. Monthly video follow-ups were conducted over a 12-month period to correct movements and monitor adherence. 2) Liuzijue: During the first week, patients were guided by a TCM nurse on the spot using a teaching video for the complete techniques of Liuzijue (xū, hē, hū, sī, chuī, xī). Training was performed once daily for 1 week. At home, patients took the exercise 30 minutes per session, 5 times weekly (at an intensity limited to mild fatigue without dyspnea). Monthly video supervision was carried out to assess the standardization and safety of the movements. Both groups received intervention for 6 months.

5. Observed indicators

5.1. Emotional assessment

Patients were assessed using the Hamilton Anxiety Rating Scale (HAMA) at baseline, 3 months, and 6 months after treatment. A total HAMA score ≥29 suggested severe anxiety; ≥21 indicated significant anxiety; ≥14 indicated definite anxiety; >7 suggested possible anxiety; <7 indicated no anxiety symptoms.

5.2. Clinical symptom assessment

1) Dyspnea Score (mMRC): The severity of dyspnea was graded from 0 to 5 based on activity-induced dyspnea, with higher levels indicating more severe dyspnea.

2) Quality of life assessment (CAT): The impact of the disease was quantified using 8 symptom items (total score: 0–40).

6. Statistical analysis

Data were analyzed using SPSS 27.0 software. Continuous variables were presented as mean±standard deviation (x±s). After the normality (Shapiro-Wilk test) and homogeneity of variance (Levene's test) were verified, inter-group comparisons were conducted using independent samples *t*-tests, while intra-group changes before and after intervention were analyzed using paired *t*-tests. For non-normally distributed data, the Mann-Whitney U test was applied. For categorical variables, the chi-square test was used for unordered categories, and the Mann-Whitney U test was used for ordered categories, with $P < 0.05$ indicating statistically significant.

7. Results

7.1. Demographics

A total of 90 patients with moderate-to-severe stable COPD were enrolled in this study, 79 of whom completed the final follow-up (control group: n=40; experimental group: n=39). There were no significant differences between the two groups in terms of baseline demographics (age, height, weight, gender, smoking) (all $P > 0.05$), as shown in **Table 1**.

7.2. Comparison of HAMA scores before and after intervention between groups

Before intervention, there was no significant difference between the two groups in HAMA scores ($P > 0.05$). After 3 months of intervention, both groups showed significantly reduced HAMA scores, with the experimental group demonstrating a more pronounced improvement ($P < 0.001$). After 6 months, the HAMA scores continued to decline in both groups, and the gap between the two groups gradually widened (**Table 2**).

7.3. Comparison of mMRC scores before and after intervention between groups

Before intervention, there was no significant difference between the two groups ($P > 0.05$). After 3 months, the experimental group showed significant improvement in dyspnea ($P < 0.05$), while the control group showed no significant change, with a significant difference observed between the two groups. At 6 months, both groups demonstrated significant improvement in dyspnea ($P < 0.05$), with a significant difference between groups ($P < 0.05$), as shown in **Table 3**.

7.4. Comparison of CAT scores before and after intervention between groups

Before intervention, there was no significant difference between the two groups ($P > 0.05$). After 3 months, there was a significant difference in CAT scores between the two groups ($P < 0.05$), but no significant between-group difference was detected. After 6 months, the difference between the experimental group and the control group became pronounced ($P < 0.05$), as shown in **Table 4**.

Table 1. Comparison of baseline characteristics

Item	Control group (n=40)	Experimental group (n=39)	t/X²/U	*P*
Age (years)	68.2 ± 6.5	67.8 ± 6.1	0.52	0.604
BMI (kg/m²)	23.7 ± 3.2	23.5 ± 3.0	0.15	0.881
Gender, n(%)				
Male	26(65.0)	27(69.2)	0.056	0.813
Female	24(35.0)	12(30.8)		
Smoking status, n (%)				
Smoker	22(55.0)	23(59.0)	0.051	0.812
Non-smoker	18(45.0)	16(41.0)		

Table 2. Comparison of HAMA scores between two groups of COPD patients

Item	HAMA score		
	Baseline	After 3 months	After 6 months
Control group (*n*=40)	16.08±1.26	12.95±1.45*	12.30±1.50*
Experimental group (*n*=39)	15.97±1.22	11.82±1.30*#	10.15±1.25*#
t	0.364	3.624	5.237
P	0.717	0.001	<0.001

* means $P < 0.05$ compared with before treatment. # means $P < 0.05$ compared with the control group

Table 3. Comparison of mMRC scores between two groups of COPD patients

Item	mMRC score		
	Baseline	After 3 months	After 6 months
Control group (*n*=40)	3.0 (2.0, 3.0)	3.0 (2.0, 3.0)	2.5 (2.0, 3.0)*
Experimental group (*n*=39)	3.0 (2.0, 3.0)	2.5 (2.0, 3.0)*#	2.0 (1.0, 2.0)*#
Z	-0.457	-1.992	-3.124
P	0.648	0.046	0.002

* means $P < 0.05$ compared with before treatment. # means $P < 0.05$ compared with the control group

Table 4. Comparison of CAT scores between two groups of COPD patients

Item	CAT score		
	Baseline	After 3 months	After 6 months
Control group (n=40)	27.80±1.99	27.18±1.65*	25.75±1.84*
Experimental group (n=39)	28.42±2.04	26.15±1.68*	24.85±1.71*#
t	-1.348	2.717	2.263
P	0.182	0.08	0.026

* means $P < 0.05$ compared with before treatment. # means $P < 0.05$ compared with the control group

8. Discussion

Chronic obstructive pulmonary disease (COPD) is a preventable and treatable chronic respiratory disease, characterized by persistent abnormalities in airway and/or alveolar structure as a result of exposure to toxic particles or gases [5]. The adverse prognosis in COPD extends beyond pathophysiological damages caused by the disease itself, being closely related to the risk of acute exacerbation, treatment complexity, and multiple comorbidities [6]. The modern incidence of COPD combined with emotional disorders is increasing, with foreign studies indicating an incidence of 30%–50% for anxiety in COPD [7]. Data from China also suggests that due to the impact of evaluation tools and population heterogeneity, the incidence ranges from 19.5% to 50% [8–9]. So far, the pathogenesis of anxiety in COPD has not been fully elucidated, but it may involve multiple factors, such as demographics, disease severity, comorbidity burden, and psychosocial factors [10]. Existing therapeutic strategies mainly combine pharmacologic with non-pharmacologic interventions, but commonly using tricyclic antidepressants may increase the risk of side effects of bronchodilator by inhibiting the activity of acetylcholinesterase [11]. In contrast, non-pharmacological treatments hold potential, but are often limited in clinical practice because of factors like patients' physical condition, transportation difficulties, and economic burdens [12]. Thus, it is of great value to find convenient and highly adherent options.

Tai Chi, as a traditional physical and mental exercise that integrates the concept of "harmonizing both the body and mind", has been proven to alleviate anxiety through multiple pathways. The mechanisms mainly include: autonomic regulation—the gentle movements and deep breathing of Tai Chi can decrease sympathetic excitability and increase parasympathetic activity, thereby reducing cortisol secretion and improving anxiety-related physiological responses [13]; inflammation inhibition—randomized controlled trials have suggested that 12 weeks of Tai Chi training can significantly bring down the levels of pro-inflammatory factors such as IL-6 and TNF-α in the serum of anxiety patients, mitigating the negative effects of neuroinflammation on the emotional center [14]. Tai Chi, combining music and physical exercises, aligns with the concept of "regulating the mind" and helps relieve anxiety and depression, thus creating a positive rehabilitation environment. In addition, a systematic review has pointed out that Tai Chi demonstrates significantly better efficacy in alleviating generalized anxiety disorder (GAD) than conventional exercise interventions [13]. Taken together, Tai Chi offers a non-pharmacological, low-risk supplementary therapy for anxiety management from multiple dimensions, especially suitable for long-term use in patients with chronic diseases.

In contrast, the Liuzijue is one of the traditional Chinese guiding techniques, which combines six sounds (Shee, Haw, Hu, Sss, Chwee, See) with specific breathing movements to regulate the meridian system, improve the functions of five viscera and six entrails, balance qi and blood, regulate the diffusion and descent of qi in the lung and stabilize emotions [15–16]. It has remarkable and multifaceted benefits for COPD patients' dyspnea and anxiety: optimized respiratory function through diaphragmatic breathing patterns, which enhances diaphragm contraction, expands the volume of alveolar ventilation, reduces the ratio of residual volume and total lung capacity, and improves ventilation-blood flow

matching efficiency [17]. The enhancement of exercise endurance is demonstrated through the strengthening of quadriceps and other lower limb musculature, through center-of-gravity shifting movements in a semi-squat position, which helps mitigate exercise-induced dyspnea. On the other hand, the Liuzijue can indirectly promote mental health by improving cognitive function and sleep quality [18]. With its low-intensity and high-safety profile, it is suitable for a wide range of individuals, forming a virtuous cycle of "breathing-exercise-psychology." In conclusion, the Liuzijue, through its breath training, integrates the enhancement of physiological function and psychological regulation, providing a safe and accessible non-pharmacological intervention for COPD patients and anxious individuals.

The findings demonstrate that the treatment group receiving the combined intervention of Tai Chi and the Liuzijue exhibited significantly lower HAMA scores at both the 3-month and 6-month follow-ups than the control group (both $P < 0.05$), suggesting that their synergy had a sustained additive effect on improving anxiety, which is consistent with previous findings [19]. In terms of dyspnea improvement, the treatment group showed significant improvement in the 3rd month, and by the 6th month, the intergroup difference was noticeable, probably due to the effects of Tai Chi and the Liuzijue on respiratory muscle training and improvement of lung function. In terms of quality of life, the CAT scores showed noticeable improvement after 3 months, and by the 6th month, intergroup differences were observed, which may be related to multiple mechanisms, such as enhanced peripheral muscle endurance from Tai Chi, the regulation of breathing patterns, and alleviation of respiratory muscle fatigue from the Liuzijue [20]. From a clinical perspective, the findings offer novel insights into the individualized management of COPD patients. For those who do not tolerate anxiolytic drugs or have poor adherence, TCM pulmonary rehabilitation may serve as a valuable alternative or adjunctive therapy.

Despite the promising findings, this study has several limitations: the sample size was small and the intervention period was only 6 months, meaning that it was impossible to observe long-term efficacy and changes in acute exacerbation frequency; difficulties in implementing the blinding method: due to the special nature of the intervention (e.g., active participation in Tai Chi), it was impractical to implement blind procedures for patients and researchers, which may introduce potential measurement bias; mechanistic gaps: biological indicators (e.g. serum cortisol and IL-6 levels) were not measured, limiting the ability to fully elucidate the neuroendocrine and anti-inflammatory mechanisms of TCM rehabilitation. Future studies can focus on the following directions: expanding the sample size and extending follow-up periods; incorporating multi-center, large-sample cohorts to assess the long-term effects of TCM rehabilitation on the acute exacerbation and hospitalization rates of COPD.

This study demonstrates that TCM-based pulmonary rehabilitation—specifically, the combination of Tai Chi and the Liuzijue—can effectively improve the psychological status, dyspnea, and quality of life of moderate-to-severe COPD patients with anxiety, and that its efficacy is significantly better than that of conventional Western treatments. This finding highlights the unique value of TCM in chronic disease management. Nevertheless, the clinical applicability and mechanisms of this intervention require further validation through larger-scale, longer-duration trials in the future.

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Disclosure statement

The authors declare no conflict of interest.

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