

The Effectiveness of Tai Chi on Increasing Exercise Capacity and Quality of Life in Patients with Chronic Obstructive Pulmonary Disease: A Systematic review. (Tai Chi Effectiveness in COPD Patients)

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Abstract

Chronic Obstructive Pulmonary Disease (COPD) is a chronic respiratory disease characterized by persistent and usually progressive airflow obstruction with an increased chronic inflammatory response to the airways caused by certain irritant particles. Tai Chi exercises can be applied as a therapeutic modality in pulmonary rehabilitation programs in patients with stable COPD. This systematic review aims to examine the effectiveness of Tai Chi in improving exercise capacity and quality of life in patients with Chronic Obstructive Pulmonary Disease.

This systematic review search was conducted using four databases: CINAHL, PubMed, Science Direct, and Scopus, for the last ten years, starting from 2011- December 2020. The keyword combinations used were: 'Tai Chi', 'Tai Chi Chuan', 'Tai Ji Quan', 'Quality of Life', 'Health-Related Quality of Life', 'Life Quality', 'Exercise Capacity', 'COPD', 'Chronic Obstructive Pulmonary Disease'. Joanna Briggs Institute (JBI) critical appraisal checklist for randomized controlled trials was used to assess selected articles' bias and methodological quality.

The total articles obtained were 258 articles and 10 research articles were taken using the RCT method for analysis. A 6-month Tai Chi program under the guidance of a therapist can improve exercise capacity and quality of life in COPD patients.

Tai Chi is a therapeutic modality that effectively increases exercise capacity and can also improve the quality of life in patients with COPD.

Review (J Int Dent Med Res 2021; 14(4): 1753-1759)

Keywords: Tai Chi, Quality of life, Exercise Capacity, Chronic Respiratory Diseases, Chronic Obstructive Pulmonary Disease.

Received date: 15 February 2021

Accept date: 06 August 2021

Introduction

Chronic Obstructive Pulmonary Disease (COPD) is a health problem that affects many people around the world. WHO predicts that COPD will be the number 3 cause of death worldwide in 2030 and is ranked 5th (DALYs) in the same year¹. Persistent respiratory symptoms and restricted airflow characterize COPD. The most common respiratory symptoms suffered by patients are dyspnea, cough with sputum

production or not. COPD patients often suffer from dyspnea and exacerbations, causing the patient to become unproductive, tired quickly during daily activities, resulting in decreased functional capacity and quality of life².

The Global Burden of Disease Study reported a prevalence of 251 million cases of chronic obstructive pulmonary disease globally in 2016. Globally, an estimated 3.17 million deaths were caused by this disease in 2015 (i.e., 5% of all deaths globally that year). More than 90% of COPD deaths occur in low- and middle-income countries³. The leading causes of Chronic Obstructive Pulmonary Disease are the age and a history of regular smoking. Exposure to dust and fumes from the workplace can also cause COPD². In addition, some COPD is also caused by long-term asthma. COPD cannot be cured,

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but treatment can relieve symptoms, improve quality of life and reduce the risk of death³. The quality of life of COPD patients certainly has decreased significantly. This is because both physically, psychologically and socially, patients are disturbed because they often experience exacerbations. Therefore, pharmacological therapy is undoubtedly the primary choice if the patient often experiences relapses and has difficulty resting⁴. In the management of COPD recurrence, it is not enough to rely on pharmacological therapy alone. Non-pharmacological treatment is also essential if the patient's condition has begun to stabilize. In addition, Can do a combination of pharmacological therapy and rehabilitation programs such as exercise, smoking cessation, psychological support, breathing exercises, walking activities to manage COPD patients to prevent a recurrence⁵.

Tai Chi is a slow, continuous movement exercise that combines strengthening, balance, and relaxation elements. Tai Chi comes from China. In COPD management, Tai Chi can significantly increase respiratory muscle strength and strengthen upper and lower limb functions and quadriceps. In the physical rehabilitation of COPD patients, Tai Chi has been widely applied. In various studies, Tai Chi exercises could reduce symptoms of dyspnea, improve lung function, increase exercise capacity, and improve the quality of life of COPD patients⁶.

This fact review aims to determine the effectiveness of Tai Chi for improving lung function and quality of life in patients with COPD.

Materials and methods

In compiling a systematic review, a review protocol is prepared to be structured according to the guidelines. This protocol includes the rationale and purpose of the evaluation, eligibility criteria for the study, sources of information, the search strategy to be used, the study selection and data collection process, the results to be found, the methods for assessing the risk of bias for individual studies, and the synthesis of data. Systematic reviews are reported following the Preferred Reporting Item Guidelines for Systematic Review and Meta-analysis (PRISMA)⁷.

Search Strategy

Systematic literature searches were

carried out using four electronic databases: CINAHL, PubMed, Science Direct, and Scopus. The search was carried out in December 2020. The developed combination of keywords and MESH terms was then adapted to other databases. The keywords and subject titles used in the search for articles were 'Tai Chi', 'Tai Chi Chuan', 'Tai Ji Quan', 'Quality of Life', 'Health-Related Quality of Life', 'Life Quality', 'Exercise Capacity', 'COPD', 'Chronic Obstructive Pulmonary Disease' published in the last 10 years (2011-2020) in English, full-text articles, using Boolean Logic (and, or) in searching for articles.

Inclusion and Exclusion Criteria

Inclusion Criteria: Search for journal articles using the PICOT framework (can be seen in table 1), (Population: Patients with COPD, Intervention: Tai Chi is either used as a single intervention or as part of joint intervention, Compare: Patients with COPD who do not receive Tai Chi interventions, Outcomes: Increased exercise capacity and quality of life, Time: 2011-2020). Exclusion Criteria: Articles that do not address Tai chi in COPD patients, articles without full text and abstracts without complex intervention, timeless than 2011 and studies conducted in languages other than English, and non-RCT designs were excluded.

Study Selection

According to the PRISMA guidelines, potential articles are first retrieved from an electronic database. The articles that are found are then selected starting from the title and the suitability of the abstract. After that, the same articles will be deleted. The full text of each article chosen that met the inclusion criteria was taken for further review. Finally, pieces that were relevant and met all inclusion criteria were included in the systematic review. Five independent reviewers carried out the search and screening process.

Risk of Bias

The Joanna Briggs Institute critical appraisal checklist was used to assess the methodological quality of the included randomized controlled trials⁸. Five independent reviewers assessed the risk of bias for each included study. Any disagreements were resolved by discussion.

Data extraction

In displaying information from articles, a structured form is used so that the results

obtained are of quality, starting from the author, year, country, design, age of the respondent, sample size, intervention, results, and conclusion of the article to evaluate the effect of the intervention.

Result

Study Selection

A total of 258 articles were identified. Then duplicate removal was carried out, and the remaining 251 articles were reviewed for eligibility. Then 88 articles were excluded based on the last 10 years, randomized control trial (RCT), and english, so that there were 163 articles. Finally, from the due diligence full-text article, 57 articles and 10 research articles were taken for review. (Figure 1)

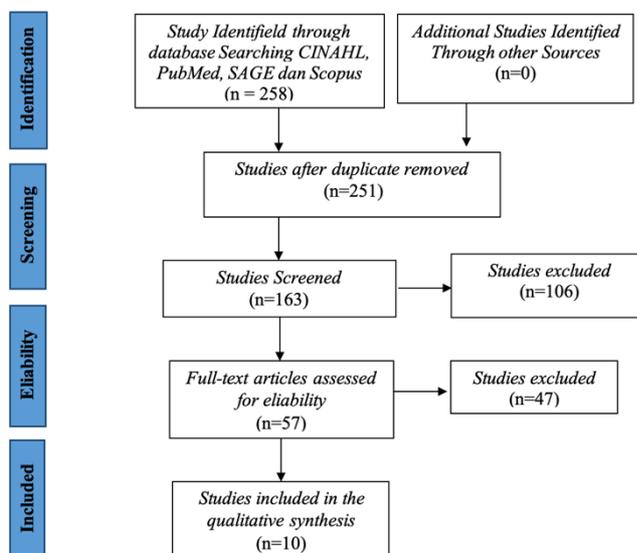


Figure 1. Flow chart of study selection.

Risk of Bias

Risk assessment of bias using the JBI critical appraisal checklist for randomized controlled trials (can be seen in table 2)

Study of Characteristics

The included articles were published in 2011 - 2020, of the 10 selected papers all came from abroad, from (China=3)^{6,10,14}, (Hong Kong=3)^{11,13,16}, (Thailand=1)¹, (USA=1)¹², (UK=1)⁹, (Australia=1)¹⁵. The total respondents of this review were 1,138. The total population involved ranged from 42 to 206 participants. Participants involved were limited by several criteria, such as Inclusion Criteria: Patients diagnosed clinically with mild or moderate COPD

by the American Thoracic Society (ATS) or the Global Initiative for Chronic Obstructive Lung Disease (GOLD) are 40 years or older and able to walk independently, FEV1 <80% of estimate and FEV1 ratio to forced vital capacity <0.70; Exclusion Criteria: Respiratory failure or stage 4 GOLD unable to perform 6 MWT, exacerbation of COPD requiring steroids, patients taking antibiotics, or hospitalization within the last 2-4 weeks, planned thoracic surgery in the next three months, hypoxemia at 6 MWT or cardiopulmonary exercise test (oxygen saturation <88% with supplemental oxygen), inability to walk due to vascular or neuromuscular conditions obstructing walking difficulties, clinical signs of unstable cardiovascular disease (e.g., chest pain at 6MWT), severe cognitive dysfunction, currently participate in pulmonary rehabilitation and patients suffering from depression.

Characteristics of the Intervention

Characteristics of the Intervention (can be seen in table 3). Tai Chi exercise movements are used to increase exercise capacity and quality of life in COPD patients: Modified TCQ from Dr.Pual Lam of the Tai Chi for Health Institute (n=1)¹, Traditional Cheng Man-Ch'ing's Yang-style (n=1)¹², Tai Chi 24 form Yang style (n=1)¹⁴, 12 Move sequence of Tai Chi Movements for Wellbeing (n=1)⁹, The Tai Chi program consisted of 10 forms from classical Yang Style Tai Chi (n=1)⁶, The Tai Chi program (n=1)¹⁰, 4 forms of Sun Style Tai Chi (n=2)^{13,17} and Tai Chi Qigong (n=2)^{11,16}.

Mechanism of Tai Chi exercises: Tai Chi exercises that are given face to face and posters for home exercises (n=2)^{1,9}. Tai Chi exercises are given via digital video and audio discs (n=1)¹². Tai Chi exercises are given face-to-face and via video streaming (n=1)¹⁴. Tai Chi exercises given face to face and Tai Chi training booklets and DVDs (n=4)^{6,10,13,15} and Tai Chi Exercises given face-to-face (n=2)^{11,16}.

Duration of Tai Chi exercise: 15 minutes (n=1)¹³, 30 minutes (n=1)¹², 50 minutes (n=1)¹⁰, 60 minutes (n=6)^{6,9,11,14,15,16}, not mentioned (n=1)¹.

Frequency of Tai Chi Exercises in COPD Patients: 1x exercise in 1 week (n=2)^{6,9}. 2x exercise in 1 week (n=3)^{11,15,16}. 3x exercise in 1 week (n=2)^{1,18}. 5x exercise in 1 week (n=1)¹⁴, 7x exercise in 1 week (n=1)¹⁰ and exercise 5-7x in 1 week (n=1)¹³.

Tai Chi exercises are carried out for 6 weeks (n=1)¹³, exercise carried out for 12

weeks(n=7)^{6, 9,11,12,14,15,16}.24 weeks (n=2)^{1,10}.

Discussion:

The outcome of the ten articles that have been reviewed found that Tai Chi was an effective modality of therapy given to patients with chronic obstructive pulmonary disease in increasing exercise capacity and improving quality of life. There was consistent evidence that Yoga and Tai Chi could improve exercise tolerance, functional performance, pulmonary function, and quality of life in COPD patients. In addition, their easy availability in the community added to the advantage of their role in managing COPD, alone or in combination with pulmonary rehabilitation¹⁹.

Tai Chi exercises were carried out 1-7 times a week and each session lasts 15-60 minutes. Exercise duration was for 6- 24 weeks to get optimal results. The duration of effective exercise ranged from 6 weeks to 6 months with a frequency of 2 to 7 times a week. Each session lasted 30 to 90 minutes. Benefits were observed in lung function and functional exercise capacity but clearly expressed services in both qualities of life and dyspnea²⁰.

Age characteristics in Tai Chi practice mean of age ≥ 40 years. This was because the average person can get COPD over the age of 40 and is often exposed to risk factors that can cause that person to develop this disease, such as active or passive smoking or working in chemical factories³. Therefore, the Tai Chi exercise program was carried out on average at over 40 years of age.

Tai Chi Qigong (TCQ) could be carried out in a centralized training setting led by a Tai Chi Qigong (TCQ) instructor and participants attended classes 3 times a week. They were also assigned to practice at home 2 times a week and were given Tai Chi Qigong posters to each participant to facilitate independent practice at home and were encouraged with monthly home visits to assess adherence to home exercises¹.

Conclusion

Tai Chi is one of the practical modalities of therapy given to patients with Chronic Obstructive Pulmonary Disease (COPD) in increasing exercise capacity and improving life quality. Tai Chi exercises should be done through the guidance of a Tai Chi instructor. If you have mastered the movements, you can do the exercises at home. Tai Chi exercises are done an average of 3 times a week with a duration of 30-60 minutes and carried out for up to 12 weeks to achieve optimal results.

Acknowledgments

We want to thank the Dean of the Faculty of Nursing of Universitas Airlangga for his support in writing this article.

Declaration of Interest

The authors report no conflict of interest.

PICOT framework	InclusionCriteria
Population	Patients with COPD
Intervention	Tai Chi is either used as a single intervention or as part of joint intervention.
Compartors	Patients with COPD who do not receive Tai Chi interventions.
Outcomes	Increased exercise capacity and quality of life
Time	2011-2020
Study Design	Randomized control trial
Laguage	English
Exclusion criteria:	Articles that do not address Tai chi in COPD patients, articles without full text and abstracts without complex intervention, timeless than 2011 and studies conducted in languages other than English, and non-RCT designs were excluded.

Table 1. Picot Framework.

Author and Year	JBI Critical Appraisal Checklist													Result	%
	1	2	3	4	5	6	7	8	9	10	11	12	13		
Kantatong et al. 2020	√	√	√	-	√	√	√	√	√	√	√	√	√	12	92
Yeh et al. 2020	√	√	-	√	-	√	√	√	√	√	√	√	√	11	84
Lewis and Hopkinson. 2020	√	√	√	√	√	√	√	√	√	√	√	√	√	13	100
Wang et al. 2019	√	√	√	√	√	√	√	√	√	√	√	√	√	13	100
Polkey et al. 2018	√	√	-	√	√	-	-	√	√	√	√	√	√	10	76
Ng et al. 2014	√	√	√	√	√	-	√	√	√	√	-	√	√	11	84
Niu et al. 2014	√	√	√	√	√	√	√	√	√	√	√	√	√	13	100
Chan et al. 2013	√	√	√	√	√	√	√	√	√	√	√	√	√	13	100
Leung et al. 2013	√	√	√	√	-	-	√	√	√	√	-	√	√	10	76
Chan et al. 2011	√	√	√	-	√	-	-	√	√	√	-	√	√	9	69

Table 2. Risk assessment of bias using the JBI critical appraisal checklist for randomized controlled trials.

Based on table 2, there are 10 articles assessed for risk of bias using the *JBI critical appraisal checklist for randomized controlled trials* and the results are: a score of 100% (n = 4 articles^{9,6,10,11}. Score 92% (n = 1 article)¹. Score of 84% (n = 2)^{12,13}. Score 76% (n = 2)^{14,15} and score 69% (n = 1)¹⁶.

No	Author	Country	Method	Age	Sample	Intervention	Outcome	Result
1.	Kantatong et al. 2020	Thailand	Randomized Controlled Trial	≥40 years	50 Patients	The Tai Chi Qigong (TCQ) Group completed 12 weeks of training with an instructor and did the exercises at home for 12 weeks.	6 MWT FEV ₁ FVC SGRQ mMRC	TCQ training effectively increased functional capacity, lower dyspnea scores, and improves the quality of life in COPD patients with mild to moderate symptoms.
2.	Yeh et al. 2020	USA	Randomized Controlled Trial	Average age 68 years	92 Patients	The intervention was carried out for 12 weeks. At 12 weeks, those in Tai Chi were again randomized to resume maintenance classes. All groups were followed for 24 weeks.	Symptoms (dyspnoea, fatigue), CRQ, cognitive emotional measures (mood, COPD self-efficacy) and functional status (6 MWT, lower body strength, flexibility, physical activity)	Tai Chi proved viable and safe. COPD patients who practiced Tai Chi had the potential to improve their quality of life and cognitive-emotional health.
3.	Lewis and Hopkinson. 2020	UK	Randomized Controlled Trial	The average age is 70 years	128 Patients	British Lung Foundation collaborates with the 'Tai Chi Movement for Wellbeing' Training to run a once-weekly Tai Chi class consisting of 12 sequences of Tai Chi movements for three months.	Quality of life	Tai Chi is an appropriate intervention for individuals with respiratory diseases. Tai Chi Movements have been shown to improve patients' quality of life and reduce shortness of breath.
4.	Wang et al. 2019	China	Randomized Controlled Trial	≥ 45 years	50 Patients	Participants in the Tai Chi group received a Tai Chi exercise program 3 times a week for 3 months.	Lung function, 6 MWD and CAT	The Tai Chi program is a safe, effective, and feasible method for increasing exercise capacity and quality of life in patients with COPD.
5.	Polkey et al. 2018	China	Randomized Controlled Trial	40-80 years	120 Patients	Tai Chi was practiced 5 times a week for 12 weeks.	SGRQ and 6MWT	Tai Chi is equivalent to Pulmonary Rehabilitation for improving the quality of life in patients with COPD.

7.	Niu et al. 2014	China	Randomized Controlled Trial	≥ 45 years	40 Patients	Participants in the Tai Chi group underwent four supervised Tai Chi program sessions and three home-based Tai Chi program sessions per week with one session per day. The entire program lasted six months. Each session consisted of 10 minutes of pre-workout warm-up, followed by a 30-minute Tai Chi program and 10 minutes of post-workout relaxation.	Lung function, blood gas, 6MWD, and diaphragm strength.	Tai Chi improved lung function, exercise capacity, and diaphragm strength.
8.	Chan et al. 2013	Hong Kong	Randomized Controlled Trial	71-74 years	206 Patients	Subjects in the TCQ group completed a Tai Chi Qigong program which consisted of two 60 minutes sessions each week for three months. They were advised to continue daily self-practice Tai Chi Qigong after completing the instructor-led program.	SGRQ and MSPSS	TCQ is effective in psychosocial enhancement in COPD patients. Continuous self-practiced Tai Chi Qigong maintains its beneficial effects for a longer time, significantly improves quality of life, and increases self-felt social support from friends.
9.	Leung et al. 2013	Australia	Randomised trial	70-75 years	42 Patients	TCQ participants attended two supervised 1-hour sessions each week for 12 weeks of Sun Style Tai Chi training. Participants began training by studying two to three forms per week by completing all 21 forms by week eight. In each training session, participants were prepared with the SSTC forms they had learned up to that session.	Exercise capacity, Physical performance, balance, and quadriceps isokinetic strength, HRQoL, anxiety and depression and self-reported	Sun Style Tai Chi is an effective training modality in people with COPD who achieve moderate exercise intensity that meets training recommendations.
10.	Chan et al. 2011	Hong Kong	Randomized Controlled Trial	≥ 40 years	206 Patient	Patients in the TCQ group were instructed to complete 60-minute TCQ exercise sessions, twice a week, for three months, led by a qualified TCQ master. Participants are also advised to practice TCQ exercises for 1 hour every day	SGRQ and MSPSS	Tai Chi Qigong improved health outcomes concerning clients' perceptions of their respiratory symptoms. In addition, TCQ reduces the disruption to their physical activity.

Table 3. Study Characteristics and Findings.

*Note: CAT: COPD Assessment Test, 6 MWD: 6-min walking distance, 6 MWT: 6 minutes walking test, COPD: Chronic Obstructive Pulmonary Disease, COPD-CSES: COPD self-efficacy scale, CRQ: Chronic Respiratory Questionnaire, FEV1: Forced Expiratory Volume 1, FVC: Forced vital capacity, HRQoL: Health-Related Quality of Life, mMRC: Modified Medical Research Council, MSPSS: Multidimensional Scale of Perceived Social Support, SEMSOB: self-efficacy for managing shortness of breath, SGRQ: St. George's Respiratory Questionnaire, SSTC: Sun Style Tai Chi training, TCQ: Tai Chi Qigong.

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