

LITERATURE REVIEW

Effect of Walking Exercise with Breathing Control on the Degree of Shortness of Breath, Anxiety, and Depression in COPD: A Systematic Review

Orita Satria^{1*} , Dewi Elizadiani Suza^{2,3} , Mula Tarigan^{2,3} 

¹Nursing Study Program, STIKes Medika Seramoe Barat, Aceh, Indonesia.

²Faculty of Nursing, University of Sumatera Utara, Medan, Indonesia.

³Doctor of Philosophy Program in Nursing Science, Prince of Songkla University, Songkhla, Thailand.

ARTICLE INFO	ABSTRACT
<p><i>Article history:</i> Received 9 February 2022 Received in revised form 27 September 2022 Accepted 29 September 2022 Available online 30 September 2022</p> <hr/> <p><i>Keywords:</i> Anxiety and depression, Breathing control, COPD, Human and health, Walking exercise.</p>	<p>Introduction: Chronic obstructive pulmonary disease (COPD) is a high disease burden and negatively impacts the bio-psycho-social well-being of patients, such as anxiety, depression, and shortness of breath. Anxiety and depression can increase morbidity and worsen the condition and health status of the patient. This systematic review aimed to analyze the effect of walking exercises with breathing control on the degree of shortness of breath, anxiety, and depression in COPD patients19-related lung fibrosis to improve quality of life and prevent further lung damage.</p> <p>Methods: The data sources were taken from EBSCO, PubMed, and ProQuest using related keywords. Articles were selected using the preferred reporting items for systematic reviews and meta-analyses (PRISMA) diagram method</p> <p>Results: Ten articles in this systematic review obtained three intervention categories: 1) intervention combined walking exercises with breathing control can be performed 30 minutes per session 2-3 times a week; 2) walking exercise intervention is performed thrice a week for 30-45 minutes per session; 3) breathing control exercise intervention is performed 10-30 minutes with a duration of 2 times a day in the morning and night or can be performed three times a week. Those three intervention categories significantly reduced the degree of shortness of breath, anxiety, and depression in COPD patients</p> <p>Conclusion: Findings from this systematic review suggest that walking exercise intervention in COPD patients can help reduce the degree of shortness of breath, anxiety, and depression</p>

INTRODUCTION

Chronic obstructive pulmonary disease (COPD) is a chronic respiratory tract disease that is potentially fatal and non-reversible airway disease. COPD is characterized by symptoms of small airway airflow obstruction and lung parenchymal damage, generally characterized by inflammation of the lungs due to air pollution and harmful gases.¹ The World Health Organization (WHO) estimated that by 2030 COPD will

be the third leading cause of death in the world, and currently, 64 million people live with COPD, and three million people die from COPD.² The United States (US) prevalence rate for COPD ranges from 10-21%. In Europe, the prevalence of COPD is 3% in the Netherlands and 26.1% in Austria. The estimation of COPD prevalence varies widely in Asian countries, with the highest at 6.7% in Vietnam and Singapore and the lowest at 3.5% in Hong Kong.³

*Corresponding author: oritasatrial1@gmail.com



Based on data from the Global Burden of Disease Study (GBD), it is stated that 5% of all deaths in the world are due to COPD, with an estimated 3.17 million deaths occurring in 2015 and 251 million COPD cases in 2016. Low and middle-income countries account for more than 90% of COPD deaths. In the past 30 years, the death rate associated with COPD has doubled, implying that the health care system is failing to address the problem.⁴ COPD is a high disease burden and negatively impacts patients' bio-psycho-social well-being, such as shortness of breath, anxiety and depression, and quality decreasing of life. Anxiety and depression can worsen the health condition of COPD patients, resulting in increased morbidity.⁵

Shortness of breath is a widespread and most troublesome complaint in COPD patients because it causes the inability to get air to breathe regularly.⁶ It causes an increase in respiration rate. The brain responds to shortness of breath by sending signals that it is difficult to breathe. This response can trigger anxiety and panic attacks in patients with COPD. Panic attacks and anxiety can also cause breathing difficulty. Because these symptoms affect each other, COPD patients often get stuck in the cycle, where breathing difficulty triggers anxiety, making breathing harder for COPD patients.⁷

Walking exercises can reduce shortness of breath, symptoms of depression and anxiety, increase recovery time after an acute exacerbation event, and improve quality of life. Training can be performed 2-3 times weekly for 10-30 minutes. Walking begins with slow steps, which are then slightly increased each day.⁸ Breathing exercises can help to calm the respiratory tract to warm and humidify the inhaled air and simultaneously filter the air to become cleaner and return the oxygen to the body faster. This breathing pattern exercise can be performed for 5-10 minutes.⁹ This systematic review analyzed how walking activities with respiratory control reduce breathlessness, anxiety, and depression in COPD patients.

METHODS

This systematic review used a narrative descriptive analysis of some of the main findings from research articles that discussed the effect of walking exercises with breathing control on decreasing the degree of shortness of breath, anxiety, and depression in COPD patients. Preferred reporting items for systematic review and meta-analyses (PRISMA) guidelines were

used as a standard in reviewing and selecting research articles to improve the quality of selecting research articles in a systematic review consisting of four stages.¹⁰

The population, intervention, comparison, and outcome (PICO) model was also used to determine inclusion and exclusion criteria. PICO is a framework that can help construct comprehensive foreground clinical questions and guide systematic reviews.¹¹

Inclusion and Exclusion Criteria

Inclusion and exclusion criteria are described in Table 1.

Sources of Search Information

This study used a database of international health journals as a source of articles consisting of EBSCO, ProQuest, and PubMed with a publication period of 1 January 2015 to 31 December 2020. The search strategy used keywords that match the research topic, using the equivalent word from the Medical Heading Subject (MeSH) and combining it with the standard Boolean operators (And and Or). The keywords used include "Walking Exercise" AND "Breathing Control" AND "Shortness of Breath" AND "Anxiety and Depression" AND "Cronic Obstructive Pulmonary Disease (COPD)".

Article Selection

The PRISMA method was used for the process of selecting research articles. The first stage was identifying and combining research articles from all search sources in the database. The second stage was screening, selecting articles based on the title and abstract, and then adjusting to the inclusion and exclusion criteria. The third stage was eligibility based on the research article's full text and also by the inclusion criteria. The fourth stage was the included stage; articles that had been reviewed in the full text would be included at this stage because relevant research articles had been obtained with the topic and research title for the systematic review.¹²

Quality Assessment

The quality of the article was assessed using the Joanna Briggs Institute (JBI) Critical Appraisal guideline as an instrument for assessing the quality of the methodology and determining possible biases in the design, implementation, and analysis of a study. The JBI Critical Appraisal instrument is also adjusted to the type of research used, namely for quasi-experiment and randomized controlled trials.¹³

Table 1. Inclusion and exclusion criteria

Inclusion Criteria	Exclusion Criteria
1. The population focuses on COPD with GOLD I, II, III and IV criteria with stable conditions	The population of COPD with acute exacerbation, pulmonary Ca and being hospitalized, cardiomegaly, and heart diseases
2. Interventions used in research articles on intervention in COPD patients	Intervention not targeted at COPD
3. Outcome measures focused on decreasing the degree of shortness of breath, anxiety, and depression	Measurement of decreased degrees of breathlessness, anxiety, and depression is not in COPD patients
4. Quasi-experiment and RCT	Case study, cross-sectional study, qualitative research, literature review, editorial, commentary, systematic review and meta-analysis
5. Full text articles and published from 1 January 2015 to 31 December 2020	Research articles published before 1 January 2015
6. Articles in English	

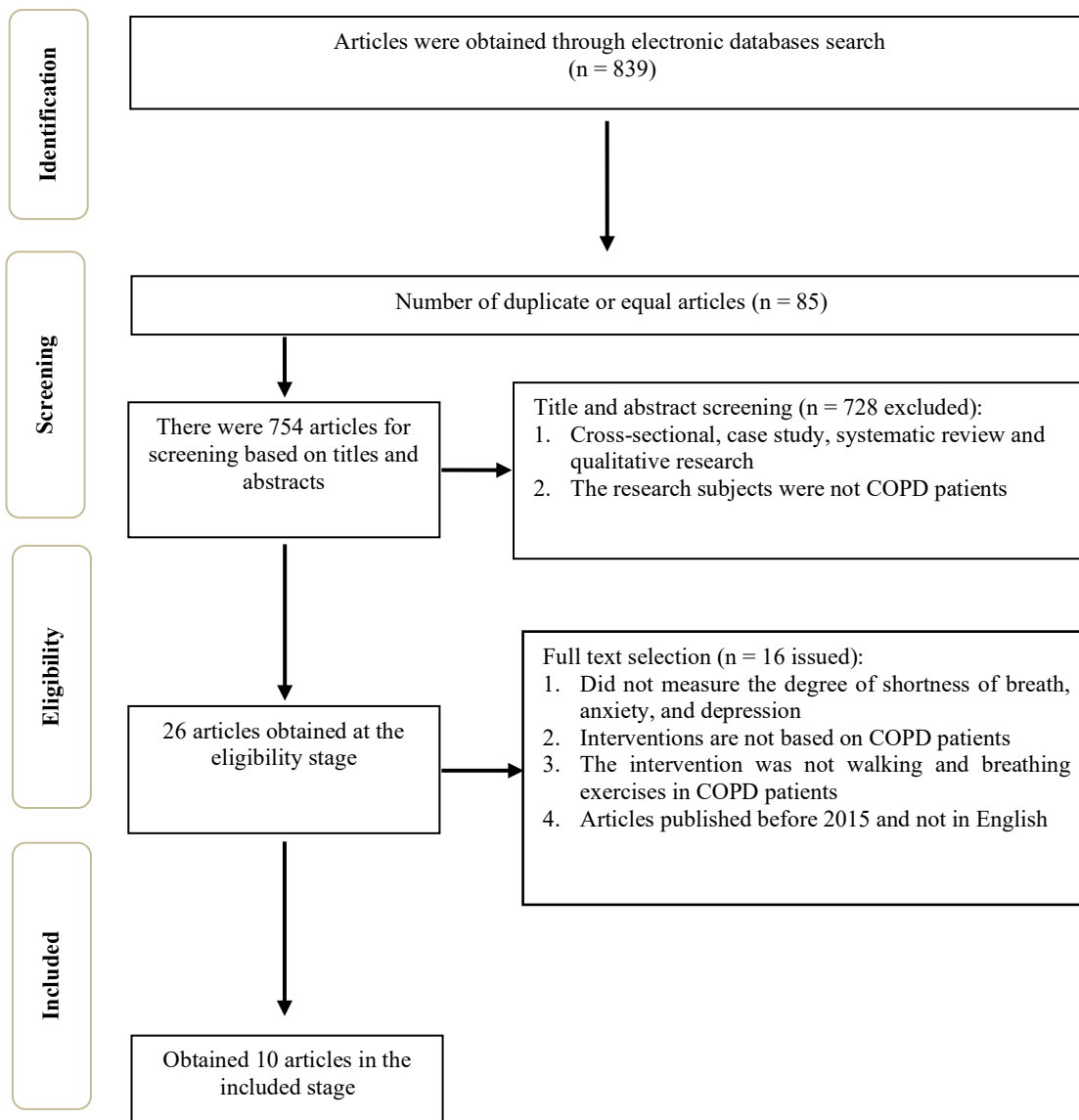
**Figure 1.** PRISMA flow diagram of identification and selection of articles

Table 2. Summary of data extraction result

No.	Author, Year, Journal Title, Country	Article Title	Aim & Respondents	Design	Intervention	Validity & Reliability	Statistic Test	Key Findings	Quality Appraisal	Ethics Approval	Limitation
1	Lin, 2019 ⁵ Journal of Clinical Nursing Taipei	Two-Month Breathing-Based Walking Improves Anxiety, Depression, Dyspnoea and Quality of Life in Chronic Obstructive Pulmonary Disease: A Randomized Controlled Study	Aim: To analyze the effect of a two-month breathing walk intervention on anxiety, depression, dyspnea, and quality of life in COPD patients Total respondents: 90 COPD patients	RCT	Intervention Group: n: 42 • Exercise walking with breathing control for 30 minutes per day • Meditation • Usual care Duration: Five days a week for two months Control Group (CG): n: 42 • Usual care	Anxiety/ Depression: Hospital Anxiety and Depression Scale (HADS) CVI: 0.9 and 0.83 Cronbach's alpha: 0.75 and 0.73 Dyspnea: Modified Medical Research Council (mMRC) scale Cronbach's alpha: 0.82 Quality of life: CAT Cronbach's alpha: 0.68	Non-parametric test: Chi-Square Test	The three-month walk group significantly changed anxiety, depression, dyspnea, and improved quality of life	Reasonable	Mentioned	Participants in the study came from the same hospital, therefore it was challenging to do blinding in determining the group and the intervention given. This can lead to bias.
2	de Roos, 2018 ¹³ Physiotherapy (United Kingdom) Netherlands	Effectiveness of a Combined Exercise Training and Home-Based Walking Programme on Physical Activity Compared with Standard Medical Care in Moderate COPD: A Randomized Controlled Trial	Aim: To analyze the effectiveness of a combined exercise home walking program for ten weeks of daily physical activity and standard medical care in COPD Total respondents: 53 COPD patients	RCT	Intervention Group: n: 26 • Exercise program for walking at home for 30 minutes/day • Usual care Duration: 2 times a week for ten weeks CG: n: 26 • Usual care	Physical Activity Scale for Elderly Chronbach's Alpha: 0.65 Exercise Self-Regulation Efficacy Scale	Parametric test: • Independent T-Test • Paired T-Test	The home walking exercise program is one of the therapies in physiotherapy as primary care to increase physical activity in patients with moderate COPD	Reasonable	Mentioned	Implementing this intervention program can only be given to patients with mild to moderate COPD with an mMRC score of two or more because these patients have fewer symptoms and complaints

No.	Author, Year, Journal Title, Country	Article Title	Aim & Respondents	Design	Intervention	Validity & Reliability	Statistic Test	Key Findings	Quality Appraisal	Ethics Approval	Limitation
3	Wada, 2016 ¹⁴ International Journal of COPD Brazil	Effects of Aerobic Training Combined with Respiratory Muscle Stretching on the Functional Exercise Capacity and Thoracoabdominal Kinematics in Patients with COPD: A Randomized and Controlled Trial	Aim: To analyze the effect of a combination of aerobic training with stretching of the respiratory muscles on functional exercise capacity and thoracoabdominal kinematics in COPD Total respondents: 30 COPD patients	RCT	Intervention Group: n: 15 <ul style="list-style-type: none"> Aerobic exercise by stretching the respiratory muscles Usual Care CG: n: 15 <ul style="list-style-type: none"> Aerobic exercise by stretching the muscles of the upper and lower limbs Duration: Both groups conducted 24 sessions (30 minutes, conducted two times a week for four months) of aerobic exercise	Dyspnea: Modified Borg Scale Chronbach's alpha: 0.86	Analysis of covariance	A combination of aerobic exercise with breathing muscle stretching exercises can increase functional exercise capacity by decreasing dyspnea in COPD patients	Good	Mentioned	The combination of the two interventions prevents the researcher from determining which technique is more effective in providing benefits to COPD
4	Bender, 2016 ¹⁵ Journal of the COPD Foundation Chronic Obstructive Pulmonary Diseases Colorado	A Patient-Centered Walking Program for COPD	Aim: To test a walking exercise program that can be performed at home, thus it costs nothing and can be performed anytime Total respondents: 100 COPD patients	RCT	Intervention Group: n: 50 <ul style="list-style-type: none"> Exercise walking by professional trainer instructions over the phone for 30 minutes CG: n: 50 <ul style="list-style-type: none"> Exercise walking independently without instructions Usual care Duration: 20-30 minutes, performed three	mMRC scale CAT scale St. George's Respiratory Questionnaire	Analysis of covariance	A home walking exercise program can benefit mild to severe COPD patients and be used as a nursing intervention in a comprehensive COPD treatment plan	Reasonable	Not mentioned	Further tests must be performed to walk continuously for a more extended time to allow more time to assess the impact on COPD patients' health and quality of life.

No.	Author, Year, Journal Title, Country	Article Title	Aim & Respondents	Design	Intervention	Validity & Reliability	Statistic Test	Key Findings	Quality Appraisal	Ethics Approval	Limitation
					times a week for four months						
5	Basso, 2016 ¹⁶ Journal of Respiratory Care Brazil	Effects of Inspiratory Muscle Training and Calisthenics-and-Breathing Exercises in COPD with and without Respiratory Muscle Weakness	Aim: To analyze the effect of inspiratory muscle breathing exercises and gymnastic exercises as physical exercises in COPD patients on decreasing dyspnea on exertion Total respondents: 29 COPD patients	RCT	Group 1: n: 16 • Inspiratory Muscle Training (IMT) Group 2: n: 13 • Exercise and breathing exercises Duration: Both groups conducted 48 sessions (20-30 minutes, performed three times a week for four months)	mMRC scale Cronbach's alpha: 0.82	Parametric test • Paired T-Test • Independent T-Test	Inspiratory muscle breathing programs and exercises can provide clinically significant benefits in COPD patients because they can increase thoracoabdominal mobility and physical exercise capacity and reduce dyspnea during activity	Good	Mentioned	The third group only did physical exercise in general. In addition, analyzing dynamic hyperinflation and rest are needed to better account for the increase in strength and endurance of the inspiratory muscles.
6	Borge, 2015 ¹⁷ Patient Education and Counseling Nepal	Effects of Guided Deep Breathing on Breathlessness and the Breathing Pattern in Chronic Obstructive Pulmonary Disease: A Double-Blind Randomized Control Study	Aim: To analyze deep breathing exercises to decrease shortness of breath and improve quality of life and breathing patterns in moderate and severe COPD patients Total respondents: 150 COPD patients	RCT	Guided Deep Breathing Group (GDBG): n: 51 • There are instructions to adjust breathing slowly based on the respiration rate and control the breathing pattern by listening to music • Breathing exercise program for 15 minutes 2 times a day (morning and evening) Music Listening Group (MLG):	St. George's Respiratory Questionnaire Cronbach's alpha: 0.90 Global Rating Change Scale Cronbach's alpha: 0.87	ANOVA	Deep breathing positively affected breathing patterns and the perception of changes in shortness of breath in COPD compared to the music listening and the sitting still control groups	Good	Mentioned	Using the global rating change scale to assess shortness of breath may have yielded more information about possible negative changes

No.	Author, Year, Journal Title, Country	Article Title	Aim & Respondents	Design	Intervention	Validity & Reliability	Statistic Test	Key Findings	Quality Appraisal	Ethics Approval	Limitation
					n: 50 • Listening to music played by members of the group GDBG but did not get instructions to regulate breathing slowly Sitting Still Group (SSG): n: 49 • There were instructions to sit and listen to the same music for 1–2 minutes, but no instructions to do the breathing exercises for the remainder of the session. Duration: for four weeks, follow-up for four months						
7	Liu, 2019 ¹⁸ Quality of Life Research China	Group Singing Improves Depression and Life Quality in Patients with Stable COPD: A Randomized Community-Based Trial in China	Aim: To analyze the effect of group singing therapy in stable COPD patients on reducing depressive symptoms and improving quality of life Total respondents: 60 COPD patients	RCT	Intervention group: n: 30 • Relaxation exercises (5 minutes) • Respiratory exercises (10 minutes) • Vocalization exercises (15 minutes) • Singing exercises (30 minutes) • Routine health education	HADS CVI: 0.80 and 0.83 Cronbach's alpha: 0.79 and 0.75 Clinical COPD Questionnaire Cronbach's alpha: 0.80	ANOVA	Singing therapy intervention with a group can reduce depressive Symptoms and improve COPD patients' stable quality of life	Good	Mentioned	Did not include patients with very severe COPD, therefore it was uncertain whether severe COPD patients could do group singing therapy and provide positive benefits

No.	Author, Year, Journal Title, Country	Article Title	Aim & Respondents	Design	Intervention	Validity & Reliability	Statistic Test	Key Findings	Quality Appraisal	Ethics Approval	Limitation
					Duration: 60 minutes, every week for six months CG: n: 30 Receive routine health education						
8	Bove, 2015 ¹⁹ BMJ Open Denmark	Efficacy of a Minimal Home-Based Psychoeducative Intervention Versus Usual Care for Managing Anxiety and Dyspnoea in Patients with Severe Chronic Obstructive Pulmonary Disease: A Randomized Controlled Trial Protocol	Aim: To analyze the effectiveness of home-based psycho-educational interventions versus usual care in severe COPD Total respondents: 66 COPD patients	RCT	Intervention Group: n: 33 • Psychoeducative combined with breathing exercises • Psychoeducative for two weeks at home and follow-up by telephone • Usual care Follow-up I after four weeks and follow-up II after three months after the intervention CG: n: 33 • Usual care	HADS CVI : 0.70 and 0.90 Cronbach's alpha: 0.78 and 0.79 Dyspnea: Chronic Respiratory Questionnaire Cronbach's alpha: 0.85	Parametric test: • Independent T-Test • Paired T-Test	Combination of breathing techniques with psycho-educative intervention to restructure thoughts, behavior, and emotions to improve quality of life and reduce anxiety and shortness of breath in severe COPD patients	Reasonable	Mentioned	The trial was the first time testing the effects of home-based psycho-educational interventions to reduce anxiety and shortness of breath in severe COPD patients

No.	Author, Year, Journal Title, Country	Article Title	Aim & Respondents	Design	Intervention	Validity & Reliability	Statistic Test	Key Findings	Quality Appraisal	Ethics Approval	Limitation
9	Wootton, 2017 ²⁰ Respiratory Medicine Australia	Effects of Ground-Based Walking Training on Daily Physical Activity in People with COPD: A Randomized Controlled Trial	Aim: To analyze the effectiveness of walking exercise on physical activity (PA) and sedentary time (ST) in COPD patients Total respondents: 143 COPD patients	RCT	Walking Group (WG) n: 95 <ul style="list-style-type: none"> Exercise walking for 30 and 45 minutes, 2 or 3 times a week for about 8 to 10 weeks Exercises instructed by a physiotherapist CG: n: 48 <ul style="list-style-type: none"> Usual care 	St. George's Respiratory Questionnaire Chronic Respiratory Questionnaire	Non-parametric test: Chi-Square Test	Walking interventions can improve exercise capacity and quality of life in COPD patients but are ineffective in increasing daily physical activity compared to usual care	Good	Mentioned	One confusing result may be caused by a type-1 statistical error (false positive) from several analyses conducted
10	Mohammed, 2019 ⁶ Journal of Nursing Education and Practice Egypt	The Effect of Positioning and Pursed Lip Breathing Exercise on Dyspnea and Anxiety Status in Patients with Chronic Obstructive Pulmonary Disease	Aim: To analyze the effect of lip positioning and breathing exercises on dyspnea and anxiety status in COPD patients Total respondents: 60 COPD patients	Quasi-experimental	Intervention Group: n: 30 <ul style="list-style-type: none"> Positioning Purse Lip Breathing Exercise Follow-up: baseline, immediately and three months after program implementation CG: n: 30 <ul style="list-style-type: none"> Usual care 	Anxiety: Self-Rating Anxiety Scale CVI SAS: 0.80 Dyspnea: Modified Borg Scale	Multiple logistic regression Analysis	Forward-leaning intervention with breathing techniques in COPD patients can help reduce dyspnea symptoms and anxiety status and improve physiological outcomes after the intervention program	Good	Mentioned	Conducted only in one geographic area with COPD patients and small sample size, making it difficult to generalize the study results

Respondent Characteristics

The total number of respondents from 10 research articles was 578 COPD patients. Most respondents in articles with RCT design were 150 respondents.¹⁷ Of the ten articles in this systematic review, it was found that the respondents were patients with COPD stage I, II, III and IV with stable conditions. The average age of the respondents was 30-70 years old, male, high school education level, and had a smoking history. The research was conducted in various countries, including two from Brazil and one article each from Taipei, the Netherlands, Egypt, Denmark, Colorado, Nepal, China, and Australia.

Intervention Characteristics

This systematic review categorized three intervention programs from the ten articles. First, the intervention of a combination of walking exercises with breathing control consists of breathing-based walking

exercise,⁵ combined exercise training and a home-based walking program is given,¹³ and aerobic training combined with respiratory muscle stretching,¹⁴ the exercise is performed in 30 minutes per session, 2-3 times a week for 2-3 months. Second, the intervention of walking exercise is the walking program exercise,^{15,20} given 30-45 minutes per day three times a week for 2-3 months. Finally, the intervention of the breathing control exercise consists of inspiratory muscle training and breathing exercise,¹⁶ guided deep breathing,¹⁷ respiratory exercises,¹⁸ combined psychoeducative intervention and breathing exercise,¹⁹ and positioning and pursed-lip breathing exercise⁶ which are performed 10-30 minutes per day, 2-3 times a week for 1-4 months. According to the American College of Sports Medicine (ACSM)'s Guidelines for Exercise Testing and Administration, the exercise is performed 10-30 minutes per session every day following the tolerance of physical activity in COPD patients.²¹

Results of Methodological Quality Assessment

Table 3. The article assessment used JBI critical appraisal tools

Citations	Criteria													Results
	1	2	3	4	5	6	7	8	9	10	11	12	13	
RCT:														
Lin, 2019 ⁵	√	√	√				√	√	√	√	√	√		9/13 (69.2%) (Sufficient quality)
De Roos, 2018 ¹³	√	√	√				√	√	√	√	√	√		9/13 (69.2%) (Sufficient quality)
Wada, 2016 ¹⁴	√	√	√	√		√	√	√	√	√		√	√	11/13 (84.6%) (Good quality)
Bender, 2016 ¹⁵	√	√	√				√	√	√	√	√	√		9/13 (69.2%) (Sufficient quality)
Basso, 2016 ¹⁶	√	√	√	√		√	√	√	√	√		√	√	11/13 (84.6%) (Good quality)
Bove, 2015 ¹⁹	√	√	√				√	√	√	√	√	√		9/13 (69.2%) (Sufficient quality)
Borge, 2015 ¹⁷	√	√	√	√		√	√	√	√	√		√	√	11/13 (84.6%) (Good quality)
Liu, 2019 ¹⁸	√	√	√	√		√	√	√	√	√		√	√	11/13 (84.6%) (Good quality)
Wootton, 2017 ²⁰	√	√	√	√		√	√	√	√	√		√	√	11/13 (84.6%) (Good quality)
Quasi-Experiment:														
Mohammed, 2019 ⁶	√	√	√	√	√	√	√	√	√	√				9/9 (100%) (Good quality)

Based on Table 3, nine articles of RCT design were obtained, with five good-quality articles.^{14,16,18,20} The other four articles on RCT design were of sufficient quality.^{5,13,15,19} Whereas for research articles with a quasi-experimental design, one article was obtained with good quality.⁶ Based on the results of the quality assessment of the article, it was found that the risk of bias could be minimized.

Main Results

Interventions from ten research articles can be categorized into three intervention programs: 1) the intervention of a combination of walking exercises with breathing control can be performed 30 minutes per session with a duration of 2-3 times a week. Walking exercise with breathing control for each session is divided into three stages, including 5 minutes early to warm up, 20 minutes to do walking exercises by regulating breathing, and the last 5 minutes of relaxation; 2) walking exercise intervention is performed thrice a week for 30-45 minutes per session. It is performed by taking basic steps for a leisure walk and recording each step taken daily; 3) breathing control exercise intervention is performed 10-30 minutes per session with a duration of 2 times a day, morning and evening, or can be performed three times a week. Breathing control exercises are instructed by two special breathing techniques: diaphragmatic breathing and pursed lip breathing. COPD patients do slow, deep breathing through the nose and exhale slowly through the mouth by pursing the lips while simultaneously watching the upper abdominal muscles' movement. Based on the study results from the ten articles, there were three types of intervention categories which indicated that the intervention program used had a significant effect on: 1) decreasing the degree of shortness of breath, 2) anxiety, and 3) depression in COPD patients.

Risk of Bias

The research articles still have the possibility of a bias because, in research articles that used RCT design, four articles did not include blinding techniques,^{5,13,15,19} and there was one article that did not mention ethical approval in writing.¹⁵

DISCUSSION

The interventions from the ten research articles can be categorized into three intervention programs. First,

a combination intervention of walking exercises with breathing control has a significant effect on reducing the degree of shortness of breath, anxiety, and depression. Exercise is performed 30 minutes per day with a duration of every day or 2-3 times a week for 2-3 months. The results of follow-up range from 4 weeks to 3 months. The European Respiratory Society (ERS) also stated that increasing physical activity with exercise could reduce shortness of breath, depression and anxiety symptoms, improve quality of life, and increase recovery after an acute exacerbation event. Exercise can be performed 2-3 times weekly for less than 4-10 weeks. The exercise begins with walking to develop endurance, strength, and balance. Walking begins with slow steps, which are then slightly increased each day. The walking exercise can be paused and rested whenever the patient feels shortness of breath.⁸

Second is the walking exercise intervention category. Walking exercise can provide significant results in reducing the degree of shortness of breath in COPD. Exercise duration is 30-45 minutes daily, three times a week.¹⁵ According to the guidelines from ACSM, it is recommended that physical activity associated with a decrease in the degree of shortness of breath is by doing 1-3 exercise sessions with a duration of 8-12 repetitions and should be performed with a frequency of 2-3 times every week for 30-60 minutes.²² According to ASCM,²¹ walking exercises in COPD patients can increase oxygen demand, reduce shortness of breath and anxiety, and increase physical activity in COPD patients. Exercise can be increased according to the patient's ability. During breathing exercises, by walking, there is an optimal exchange of oxygen and carbon dioxide, thus it can make adequate ventilation, and the degree of shortness of breath is reduced.

Finally, the category of respiratory control intervention provides significant results that can help reduce shortness of breath and anxiety in COPD patients. Breathing control exercises are performed 10-30 minutes per session, two times a day, morning and evening, or three times a week. Based on the Guideline on Breathlessness-Shortness of Breath, breathing technique exercises are important to reduce breathlessness in patients and are an important part of a comprehensive pulmonary rehabilitation program for COPD patients.⁹ In a study by Matos-Garcia, *et al.*,²³ breathing control that is performed regularly can improve respiratory muscle

function, maintain lung elasticity, and improve ventilation function.

Several studies use mMRC and Modified Borg Scale (MBS) measuring instrument to measure the degree of shortness of breath, which consists of five questions with five types of assessment criteria ranging from grade 0 to 4. HADS was used to measuring the degree of anxiety and depression with good validity and reliability values consisting of 14 statements, both positive and negative, seven statements assessing anxiety, and seven statements assessing depression. Follow-up was performed by re-measuring the degree of shortness of breath, anxiety, and depression after the intervention administration for a period of up to 6 months.¹⁸

Limitations in the ten reviewed studies included using an RCT design that did not use the blinding technique and the follow-up time of only two months for measures of shortness of breath, anxiety, and depression.

Further Research Suggestions

Further research is still needed, and the application of blinding techniques and the use of a control group needs to be conducted to strengthen the research results. The use of other interventions as a comparison needs to be performed to see which intervention is more effective. The follow-up time for the results of the intervention also needs to be considered and added to see the extent of its effectiveness.

Implications for Practice

Based on the findings, it supports the implementation of non-pharmacological intervention as an important comprehensive pulmonary rehabilitation program for COPD patients. This nursing action can be conducted by nurses collaborating with other health teams, such as physiotherapy, to achieve maximum results. The implementation of this intervention can be used as a routine activity that must be performed by patients either at the hospital or at home.

CONCLUSION

The interventions of the ten research articles reviewed in this systematic review can be categorized into three types of intervention groups, including the combination of walking exercise with breathing control, walking exercise, and breathing control exercise. These three intervention categories that focused on COPD patients were able to provide significant results in

reducing the degree of shortness of breath, anxiety, and depression. This systematic review can also be used as a pulmonary rehabilitation program for COPD patients because it provides significant results in reducing the degree of shortness of breath, anxiety, and depression. For further research, it is expected to use the application of blinding techniques in the research.

Conflict of Interest

The authors declared there is no conflict of interest.

Acknowledgments

The authors would like to thank Prof. Dr. Runtung Sitepu as Rector of Universitas Sumatera Utara, Setiawan, S.Kp., M.NS., Ph.D. as Dean of the Faculty of Nursing, Universitas Sumatera Utara, and Siti Damayanti, S.ST., M.Keb. as Head of STIKes Medica Seramoe Barat.

Funding

This study does not receive any funding.

Authors' Contributions

Compiling, conducting systematic reviews, and writing manuscripts: OS. Providing guidance, contributing important intellectual content during drafting, and revising the manuscript: DES and MT. All authors contributed and approved the final version.

REFERENCES

1. (GOLD) GI for GOLD. *Global Strategy for the Diagnosis, Management, and Prevention of Chronic Obstructive Pulmonary Disease (2021 Report)*, https://goldcopd.org/wp-content/uploads/2020/11/GOLD-REPORT-2021-v1.1-25Nov20_WMV.pdf (2021).
2. (WHO) WHO. *Chronic Respiratory Diseases Burden of COPD*. Geneva, https://www.healthdata.org/sites/default/files/files/policy_report/2019/GBD_2017_Booklet.pdf (2019).
3. Ho T, Cusack R, Chaudhary N, *et al.* Under-and Over-Diagnosis of COPD: A Global Perspective. *Breathe* 2019; 15: 24–35.
4. (IHME) I for HM and E. *Findings from the Global Burden of Disease Study 2017*. Seattle: Institute for Health Metrics and Evaluation (IHME), 2018.
5. Lin FL, Yeh ML, Lai YH, *et al.* Two-Month Breathing-Based Walking Improves Anxiety, Depression, Dyspnoea and Quality of Life in Chronic Obstructive Pulmonary Disease: A Randomised Controlled Study. *J Clin Nurs* 2019; 28: 3632–3640.

6. el Sayed SA. The Effects of Positioning and Pursed-Lip Breathing Exercise on Dyspnea and Anxiety Status in Patients with Chronic Obstructive Pulmonary Disease. *J Nurs Educ Pract* 2019; 9: 41.
7. Ovsyannikov, Avdeev S, Budnevsky A, *et al.* Influence of Anxiety/Depression on the Subjective Evaluation of Cough in Patients with Chronic Obstructive Pulmonary Disease and Obesity. *Medicina (B Aires)* 2019; 55: 134.
8. Corbridge SJ, Nyenhuis SM. Promoting Physical Activity and Exercise in Patients with Asthma and Chronic Obstructive Pulmonary Disease. *TJNP J Nurse Pract* 2017; 13: 41–46.
9. Lareau S, Fahy B, Meek P. Breathlessness–Shortness of Breath. *Am J Respir Crit Care Med*; 202. Epub ahead of print 11 June 2020.
10. Page MJ, McKenzie JE, Bossuyt PM, *et al.* The PRISMA 2020 Statement: An Updated Guideline for Reporting Systematic Reviews. *BMJ* 2021; 372: n71.
11. Thomas E, Smith JE, Jadotte YT, *et al.* The Effectiveness of Non-Pharmacological Multicomponent Interventions for the Prevention of Delirium in Non-Intensive Care Unit, Older Adult, Hospitalized Patients: A Systematic Review. In: Holly Susan; Saimbert Maria CS (ed). New York: Springer Publishing Company, pp. 399–424.
12. (JBI) TJBI. *Checklist for Quasi-Experimental Studies*. Adelaide: The Joanna Briggs Institute (JBI), https://jbi.global/sites/default/files/2019-05/JBI_Quasi-Experimental_Appraisal_Tool2017_0.pdf (2017).
13. de Roos P, Lucas C, Strijbos JH, *et al.* Effectiveness of a Combined Exercise Training and Home-Based Walking Programme on Physical Activity Compared with Standard Medical Care in Moderate COPD: A Randomised Controlled Trial. *Physiotherapy* 2018; 104: 116–121.
14. Wada J, Borges Santos E, Cano Porras D, *et al.* Effects of Aerobic Training Combined with Respiratory Muscle Stretching on the Functional Exercise Capacity and Thoracoabdominal Kinematics in Patients with COPD: A Randomized and Controlled Trial. *Int J Chron Obstruct Pulmon Dis* 2016; Volume 11: 2691–2700.
15. Bender BG, Depew A, Emmett A, *et al.* A Patient-Centered Walking Program for COPD. *Chronic Obstr Pulm Dis* 2016; 3: 769–777.
16. Basso-Vanelli RP, di Lorenzo VAP, Labadessa IG, *et al.* Effects of Inspiratory Muscle Training and Calisthenics-and-Breathing Exercises in COPD with and without Respiratory Muscle Weakness. *Respir Care* 2016; 61: 50.
17. Borge C, Mengshoel A, Omenaas E, *et al.* Effects of Guided Deep Breathing on Breathlessness and the Breathing Pattern in Chronic Obstructive Pulmonary Disease: A Double-Blind Randomized Control Study. *Patient Educ Couns*; 98. Epub ahead of print 28 October 2014.
18. Liu H, Song M, Zhai ZH, *et al.* Group Singing Improves Depression and Life Quality in Patients with Stable COPD: A Randomized Community-Based Trial in China. *Qual Life Res* 2019; 28: 725–735.
19. Bove D, Overgaard D, Lomborg K, *et al.* Efficacy of a Minimal Home-Based Psychoeducative Intervention versus Usual Care for Managing Anxiety and Dyspnoea in Patients with Severe Chronic Obstructive Pulmonary Disease: A Randomised Controlled Trial Protocol. *BMJ Open* 2015; 5: e008031.
20. Wootton S, Hill K, Alison J, *et al.* Effects of Ground-Based Walking Training on Daily Physical Activity in People with COPD: A Randomised Controlled Trial. *Respir Med*; 132. Epub ahead of print 1 October 2017.
21. Medicine AC of S, Riebe D, Ehrman JK, *et al.* *ACSM's Guidelines for Exercise Testing and Prescription*. Wolters Kluwer, https://books.google.co.id/books?id=m_L-jwEACAAJ (2018).
22. Magal M, Scheinowitz M. Benefits and Risks Associated with Physical Activity. 2017.
23. Matos-Garcia BC, Rocco IS, Maiorano LD, *et al.* A Home-Based Walking Program Improves Respiratory Endurance in Patients with Acute Myocardial Infarction: A Randomized Controlled Trial. *Can J Cardiol* 2017; 33: 785–791.