



Effectiveness of the 4-7-8 Breathing Technique in Enhancing Sleep Quality for COPD Patients

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Abstract

Background: Chronic obstructive pulmonary disease (COPD) is a disease that is a health problem throughout the world. COPD sufferers can experience problems with decreased oxygen levels. This incidence can cause COPD sufferers to experience decreased sleep quality. Poor sleep quality will have an impact on the sufferer's physiology. Therefore, COPD sufferers can do breathing exercises, such as the 4-7-8 breathing exercises, which play a role in maximizing oxygen in the respiratory system. This study was conducted to determine the effect of 4-7-8 breathing exercises on improving sleep quality in patients with COPD

Method: This study used a quasi-experimental design with a pretest-posttest without a control. This research was conducted on 45 samples, which were recruited in Cut Nyak Dhien Regional Hospital's pulmonary polyclinic, from February 29 to March 18, 2024. The main interventions carried out are the 4-7-8 breathing technique, and the study tool is the Pittsburgh Sleep Quality Index (PSQI) questionnaire. The data analysis method used was the Wilcoxon statistical test.

Results: There is a decrease from 13.33 (pre-intervention) to 4.93 (post-intervention) for the mean score of the breathing exercise 4-7-8. There is a significant influence between influence of the 4-7-8 breathing exercise on improving sleep quality in COPD patients ($P=0.001$).

Conclusion: There is a significant effect of breathing exercise 4-7-8 on improving sleep quality in COPD patients.

Keywords: breathing exercise 4-7-8, COPD, sleep quality

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INTRODUCTION

According to the Global Initiative for Chronic Obstructive Lung Disease (GOLD) in 2023, 90% of deaths globally are now attributable to COPD, making it one of the top three causes of mortality.¹ Southeast Asia has the greatest prevalence of COPD patients (6.3%), with Vietnam and China having the highest rates (6.7% and 6.5%, respectively).² Meanwhile, Indonesia, based on the Ministry of Health's Health Research in 2019, has a COPD prevalence of 5.6% with an estimated 4.8 million.³

On closer inspection, chronic obstructive pulmonary disease (COPD) is defined as a respiratory condition characterized by symptoms of coughing, phlegm production, and dyspnea, which are caused by abnormalities of the respiratory tract and impede airflow. This air limitation can be caused

by exposure to hazardous particles or gases and is influenced by host factors, including abnormal development.⁴

Most COPD patients experience decreased blood oxygen levels and decreased arterial blood oxygen saturation, or called hypoxia. This incident can cause decreased sleep quality in COPD patients.⁵ This is a very common and significant problem in COPD patients. Various studies have shown a high prevalence of sleep disorders in this population, with estimates between 50% and 80%. The impact of this disturbed sleep quality can exacerbate the core symptoms of COPD, particularly difficulty breathing, which can ultimately contribute to the development of cognitive impairment.⁶

Management of COPD that can be done to overcome COPD symptoms, including sleep

disorders, is rehabilitation. Rehabilitation that can be done includes physical exercise, psychology, and breathing exercises. These exercises can be done at home or in the hospital. Breathing exercise itself is useful for improving ventilation and the work of the abdominal and thoracic muscles.⁷

Physiologically, breathing exercises will stimulate the parasympathetic nervous system, which can increase lung expansion so that the respiratory system can develop optimally. Breathing exercises help the body to produce adequate oxygen, where oxygen plays an important role in the respiratory system and body circulation. During breathing exercise, oxygen will flow into the blood vessels and throughout the body so that it can remove toxins and unused metabolic waste, and increase metabolism and energy production.⁸

Based on research by El Khalik et al, breathing exercises can strengthen the respiratory muscles and increase relaxation. This is what can help COPD patients improve their sleep quality and quality of life.⁹ Research shows that regular breathing control exercises can reduce anxiety and depression, improve quality of life, and enhance sleep quality.¹⁰

The 4-7-8 breathing technique is one of the controlled breathing methods that uses the duration for each phase of breathing. Developed by Dr. Andrew Weil, who that inspired by an ancient Indian yoga practice called Pranayama. This technique is a form of slow, regular breathing designed to relax the nervous system and trigger a calming response in the body.⁹

The effects of relaxation insomnia, the 4-7-8 technique is widely known as an effective sleep aid. Several studies indicate that slow breathing practices, including 4-7-8, can reduce stress levels, anxiety, and slow heart rate, all of which are major triggers for sleep difficulties (insomnia). By shifting the mind's focus from worries to the rhythm of breathing, this technique helps calm the mind and body, preparing the individual for sleep.¹¹

Based on the background, this study was conducted to determine the effect of 4-7-8 breathing exercises on improving sleep quality in patients with COPD.

METHODS

This study used a quasi-experimental design with a pretest-posttest without a control. Conducted in Cut Nyak Dhien Regional Hospital's pulmonary polyclinic over 3 weeks, from January 29 to February 18, 2024. The population included 158 COPD sufferers, collected using a purposive sampling technique. Inclusion criteria of this study are stable COPD patients at GOLD I to GOLD III levels; no comorbidities such as severe congestive heart failure, acute stroke, or severe cognitive impairment, no acute exacerbations; and willingness to be respondents.

The pretest was administered on one day at the beginning of the period, followed by the implementation of the main intervention, with follow-ups to monitor progress every two weeks. The posttest was administered on one day at the end of the month to assess the overall effect of the intervention.

The main interventions carried out are the 4-7-8 breathing technique is conducted as follows 3 steps. First, inhalation - breathing in slowly through the nose for 4 seconds. Second, breath hold - hold your breath for 7 seconds. Third, exhalation - breathe out slowly through the mouth with a hissing sound for 8 seconds.

The Pittsburgh Sleep Quality Index (PSQI) questionnaire served as the study tool. PSQI is a 19-item self-report questionnaire that measures sleep quality over the past month. Resulting in seven component scores: subjective quality, latency, duration, efficiency, disturbances, sleep medication, and daytime dysfunction. These seven components are summed to produce a global score (0-21), where a higher score indicates poorer sleep quality. The Wilcoxon test was employed as the data analysis method. Ethical approval for this study was obtained from the Institut Nalanda Jakarta, under approval number 012/LRPM/EC-IN/I/2024.

RESULTS

This study was conducted on 45 COPD patients. Table 1 shows that the majority of

respondents were male (86.7%), aged 46–55 years (31.1%), senior high school (46.7%), and employed (80%). Regarding smoking history, over half of the respondents were heavy smokers, accounting for 26 individuals (57.78%). In terms of severity level, the vast majority of respondents were categorized as GOLD III, amounting to 32 individuals (71.11%).

Table 1. Frequency Distribution of Respondents Based on Demographic Data on COPD Patients (n=45)

Category	n	%
Age		
36–45 years	7	15.6
46–55 years	14	31.1
56–65 years	12	26.7
>65 years	12	26.7
Gender		
Male	39	86.7
Female	6	13.3
Education		
Elementary School	9	20.0
Junior High School	8	17.8
Senior High School	21	46.7
College	7	15.6
Job		
Working	36	80.0
Not Working	9	20.0
Smoking History		
Moderate Smoker	19	42.2
Heavy Smoker	26	57.8
Severity Level		
GOLD I	5	11.1
GOLD II	8	17.8
GOLD III	32	71.1

Table 2 shows that the pretest of sleep quality of COPD patients with 4-7-8 breathing exercises was in the poor category for 41 people and the good category for 4 people. The post-test showed COPD patients in the poor category for 7 people and the good category for 38 people.

Table 2. Frequency Distribution of Sleep Quality Pre-test and Post-test of Giving Breathing Exercise 4-7-8 (n=45)

Sleep Quality	n	%
Pre-test		
Good	4	8.9
Poor	41	91.1
Post-test		
Good	38	84.4
Poor	7	15.6

There is a difference mean score of the breathing exercise 4-7-8 between before (13.33) and after (4.93) the breathing exercise 4-7-8 intervention.

The results of the Wilcoxon analysis obtained a value of $P=0.001$, which means there was a significant influence of breathing exercise 4-7-8 on improving sleep quality in COPD patients (Table 3).

Table 3. Effect of 4-7-8 Breathing Exercise on Improving Sleep Quality in COPD Patients at the Pulmonary Polyclinic of Cut Nyak Dhien Hospital

Sleep Quality	N	Min	Max	Mean	P
Pre-test	45	4	21	13.33	0.001
Post-test	45	2	10	4.93	

DISCUSSION

Based on the results, it is known that the level of sleep quality before and after the 4-7-8 breathing exercise has enhanced sleep quality, with the average value decreased from 13.33 (pre-intervention) to 4.93 (post-intervention) and resulting in a mean difference of 8.40. The change was statistically significant ($P=0.001$), indicating that the difference was caused by breathing exercise.

Breathing exercise is a breathing exercise to regulate the airway so that it can reduce air trapping, improve alveolar ventilation with gas exchange without increasing the work of breathing more effectively and reduce shortness of breath. This exercise program can be applied to COPD patients, which aims to regulate and improve breathing patterns and frequencies, reduce shortness of breath, and improve alveolar ventilation, gas exchange in the lungs.¹²

Research by El Khalik et al suggests that doing breathing exercises every day can improve sleep quality.⁹ These breathing exercises can strengthen the respiratory muscles and increase relaxation. The benefits of these breathing exercises can also help COPD patients improve their sleep quality and quality of life.¹¹ Research by Silalahi revealed that breathing exercise therapy improved the quality of sleep for patients with COPD. Based on these findings, it can be said that patients with COPD benefit from pursed lip breathing.⁷

Fajarini et al.'s research also stated that sleep quality requires adequate fulfillment of sleep needs, not just quantity. Providing Slow Breathing Exercises was effective in influencing and improving the fulfillment of these restorative sleep needs.¹³ This is

also in line with the results of a systematic review conducted by Satria et al, which stated that this breathing exercise intervention was effective in significantly improving sleep quality in COPD patients.¹⁴ Relaxation and breathing exercises before bed can help sufferers fall asleep faster and get a better night's sleep.¹⁰

Rahayu et al stated that to reduce fatigue, potential interventions that can be carried out include energy conservation, reducing fatigue, improving sleep quality, activity management, muscle relaxation, slow deep breathing (SDB), massage, and education.¹⁵ After the breathing exercise 4-7-8, the level of sleep quality in COPD patients improves. Although the increase in sleep quality was not significant in many ways, there was an increase in sleep quality, namely from level to ≤ 5 . This explains that the breathing exercise 4-7-8 can have an effect on improving sleep quality in COPD patients.

LIMITATION

First, this study has limitations in measurement because it relies solely on subjective data. Sleep quality measurements are based entirely on the Pittsburgh Sleep Quality Index (PSQI) instrument, which is a self-assessment questionnaire. This limitation should be emphasized because the PSQI questionnaire is not supported by objective data, such as polysomnography or actigraphy, which can provide more accurate and physiologically measurable sleep parameters. Second, the short duration of the intervention and the lack of long-term follow-up limit the ability to assess the sustainability of the effects. The 4-7-8 breathing technique intervention was only conducted over a relatively short period of time (three weeks). With such a short intervention duration, this study cannot conclude whether the observed improvement in sleep quality is permanent.

CONCLUSION

The 4-7-8 breathing exercise had a significant impact on improving sleep quality in COPD patients. This technique could be an effective non-

pharmacological intervention for sleep quality management in the COPD population.

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CONFLICT OF INTEREST

The authors have no conflict of interest to disclose.

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