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THE INFLUENCE OF THE EFFECTIVENESS ON PHYSICAL ACTIVITY IN PATIENTS WITH COPD SYMPTOM BURDENS

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ABSTRACT
Chronic Obstructive Pulmonary Disease (COPD) is characterized by prolonged airflow limitation with a high symptom burden that interferes with physical activity and results in inactivity and worsens the sufferer's condition. Objective: This study aims to determine the effectiveness of physical activity on the symptom burden that affects patients with Chronic Obstructive Pulmonary Disease (COPD). Method: The method used in writing this article is a literature review using three databases PubMed, ScienceDirect and Taylor and Francis Online with the keywords symptom burden, physical activity, COPD and quality of life. The articles published range from 2020 to 2024. During the search stage, 115 articles were found and 8 articles were found that met the criteria for review. Result: The results of the article review show that physical activities carried out by COPD sufferers such as walking, doing aerobic exercise, breathing exercises, Tai Chi movements, daily activities at home (Activity Daily Living/ADL) can be adjusted to the condition, duration, intensity and can be measured through assessments. patterns of physical activity levels (PALs), using pedometers and accelerometers. Physical activity is carried out based on guidance from health workers, physical activity counseling and home exercise (HE) effectively, easily and at a cheaper cost. Conclusions: The conclusion is that physical activity can be carried out in mild to severe COPD sufferers to maintain the activity of COPD patients in the long term and overcome symptom burden, improve lung functional status, improve general health status and improve the quality of life of COPD patients.

Keywords: COPD; physical activity; quality of life; symptom burden

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INTRODUCTION

Chronic Obstructive Pulmonary Disease (COPD) is a prevalent inflammatory lung condition characterized by persistent respiratory symptoms and airflow limitation (Xiang et al., 2022). Symptoms such as shortness of breath, coughing, and excessive sputum production due to airway abnormalities result in airway obstruction that is not fully reversible (Rantala et al., 2021). These chronic symptoms contribute to a significant symptom burden for COPD sufferers, including weakness, exacerbations, and increased mortality risk (Larson et al., 2021). COPD is a leading cause of morbidity and mortality globally (Horner et al., 2023). According to the World Health Organization (WHO), COPD is the third leading cause of death worldwide, with 90% of COPD-related deaths occurring in individuals under 70 in low to middle-income countries (Agarwal et al., 2022). In 2017, COPD affected 215 million people globally, and the incidence continues to rise due to various risk factors (Oostrik et al., 2023). In Indonesia, the prevalence of COPD was 3.7% or approximately 9.2 million people

in 2013, with an estimated increase to 4.8 million people with moderate to severe COPD by 2023 (PDPI, 2023).

COPD is marked by continuous airflow limitations and a significant symptom burden that impedes physical activity (De Bontridder et al., 2022). Symptoms worsen over time, significantly impacting health-related quality of life, with dyspnea being the most common symptom exacerbated by physical activity. Reduced physical activity leads to a worsening of COPD symptoms and triggers a cycle of inactivity and decline in physical health. In advanced stages, increased dyspnea during exercise is accompanied by fatigue, dry mouth, loss of appetite, anxiety, insomnia, and depression (Horner et al., 2023). Decreased physical activity correlates with reduced lung function, increased exacerbations, frequent hospitalizations, and higher mortality rates (Oostrik et al., 2023). COPD comorbidities further reduce physical activity levels, highlighting the importance of physical activity as both a prognostic factor and a treatment component (Xiang et al., 2022).

The Global Initiative for Chronic Obstructive Lung Disease (GOLD) recommends pharmacological therapy, including inhaled corticosteroids and bronchodilators, for stable COPD treatment. However, these treatments do not always effectively halt disease progression due to its complexity (Xiang et al., 2022). GOLD also recommends non-pharmacological interventions, such as physical activity, which have been shown to significantly improve quality of life and offer favorable prognostic and socioeconomic benefits. The American Thoracic Society (ATS) and European Respiratory Society also report that physical activity improves health outcomes in COPD patients (Xiang et al., 2022). COPD patients exhibit significantly lower duration, intensity, and amount of daily physical activity compared to healthy individuals (De Bontridder et al., 2022). Physical activity (PA) is defined as any bodily movement produced by skeletal muscles that results in energy expenditure (Xiang et al., 2022). Skeletal muscle dysfunction, a major comorbidity in COPD, affects both ventilatory and non-ventilatory muscles, leading to increased dyspnea and exercise intolerance (Llamas-Saez et al., 2023). This inactivity causes muscle deconditioning, further impairing the patient's ability to perform physical activity. Regular physical activity has been proven to reduce the risk of many chronic diseases, including COPD. Conversely, lack of physical activity is a major risk factor for worsening health conditions and can trigger premature death in COPD patients (Kohlbrenner et al., 2020; Xiang et al., 2022).

Behavior that reduces physical activity in COPD patients significantly worsens their condition (Larson et al., 2021; Mihaltan et al., 2021). To counteract this, engaging in light physical activity (LPA) can help maintain long-term activity levels (Larson et al., 2021). Types of daily life activities, such as walking, climbing stairs, and household chores, constitute LPA. Training in LPA can be undertaken by COPD patients with mild, moderate, to severe airflow obstruction (Larson et al., 2021). Compliance with LPA can increase lung functional capacity, self-efficacy, and comfort in COPD patients (Larson et al., 2021). Overall, physical activity training tailored to the characteristics, condition, and severity of the disease is expected to alleviate the symptom burden in COPD patients (Llamas-Saez et al., 2023). Despite this, many studies indicate that COPD patients maintain low levels of physical activity. Previous research shows that COPD patients struggle with symptoms, especially in the morning, leading them to limit physical activity throughout the day (De Bontridder et al., 2022). Another study found that COPD patients with high PA levels had a 34% lower risk of readmission within 30 days and a 47% lower risk of death within 12 months post-discharge compared to inactive patients (Xiang et al., 2022).

There is currently no comprehensive review of the effectiveness of physical activity training in reducing the symptom burden in COPD patients. Therefore, this study aims to determine whether adherence to physical activity training can alleviate or reduce the symptom burden in COPD patients.

METHOD

This study employs a literature review methodology. A literature search was conducted in April 2024 using the PubMed, ScienceDirect, and Taylor and Francis Online databases with keywords "symptom burden," "physical activity," "COPD," and "quality of life." Inclusion criteria were English language articles published between 2020 and 2024 employing any research method. Exclusion criteria included systematic review articles, non-research articles, and articles with overly general or broad discussions. The initial search yielded 115 articles, of which 35 were duplicates. Of the remaining articles, 72 were excluded for being non-open access, non-research articles, or not fitting the research population. Ultimately, 8 articles met the criteria for review. Search results articles are extracted based on several categories, namely author, research title, year of publication, research objectives, design and sample, research variables, instruments, data analysis, findings, conclusions and research recommendations. Next, the data is synthesized based on a narrative summary of the research results. The research results can be seen in table 1.

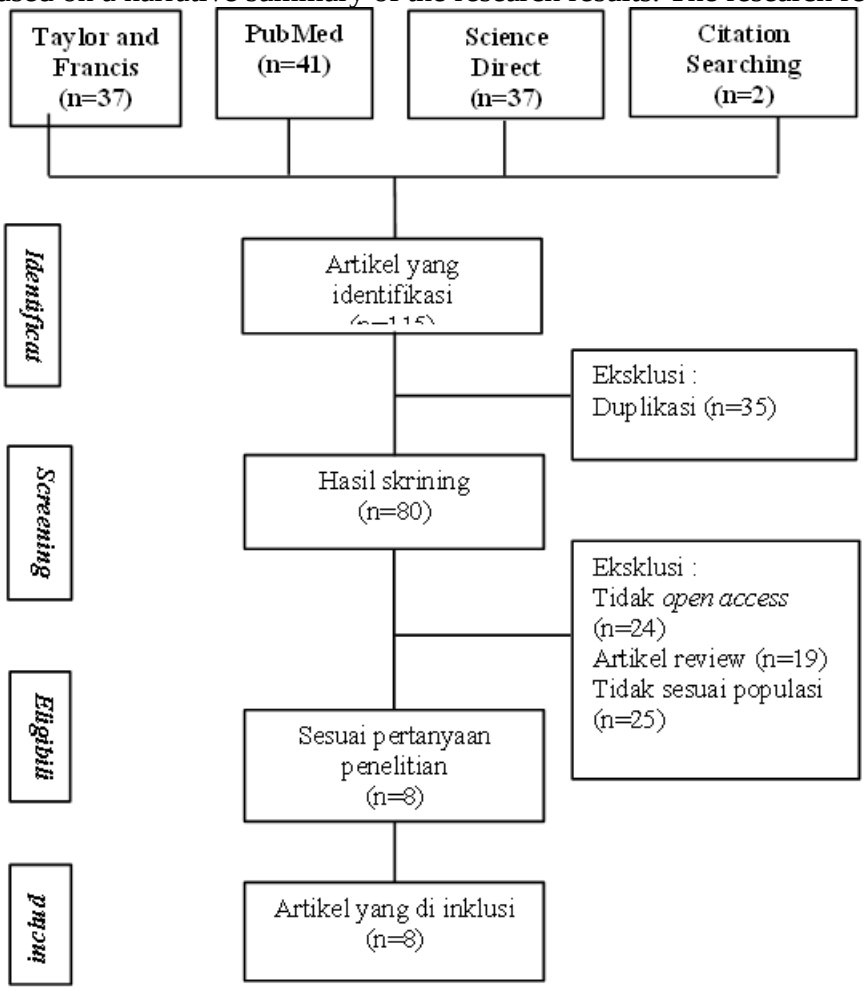

Figure 1. Article search algorithm

RESULTS

Table 1.
Literature Review

Journal Identity	Research Methods	Research Result
Janet L Larson, PhD, RN, FAANa, Katelyn E Webster, BSN, RN (2020) Feasibility and Acceptability of Active for Life with COPD, an Intervention to Increase Light Physical Activity in People with COPD	*Mixed methods study:a quasi-experimental, qualitative interviews and RCT*	The research was conducted on 54 patients, the results showed that 26 people completed the intervention and 19 people continued the intervention for 2 months. The patients reported that the intervention was enjoyable and useful with activities namely standing/stepping for 36 minutes/24 hours. This research was declared good, improves lung functional status and can be used as a long-term intervention.
Bruna Shara Vidal de Oliveira, Anna Claudia Sentanin, Leonardo Garbin Bueno, Marcela Maria Carvalho Da Silva, Juliano Ferreira Arcuri & Valéria Amorim Pires DiLorenzo (2021) Evaluation of the Level of Physical Activity and Muscle Strength of Quadriceps in Patients Hospitalized for E-COPD: A Longitudinal Study	*a longitudinal observational clinical study*	The research was conducted on 32 COPD patients after 24 hours of hospitalization, after 30 days of hospitalization and continued after 3 months of hospitalization with exercises to increase isometric quadriceps muscle strength by walking 400 steps, the results showed that there was an increase in active time doing physical activity and lung functional performance. and quality of life (P=0.04)
Kristen M. Kraemer, Daniel Litrownik, Marilyn L. Moy, Peter M. Wayne, Douglas Beach, Elizabeth S. Klings, Harry Reyes Nieva, Adlin Pinheiro, Roger B. Davis & Gloria Y. Yeh (2021) Exploring Tai Chi Exercise and Mind-Body Breathing in Patients with COPD in a Randomized Controlled Feasibility Trial	RCT	The study was conducted randomly on 92 COPD patients with Tai Chi training techniques in the form of cognitive-emotional function, walking 6 minutes for 12 weeks and 24 weeks. The results showed that Tai Chi provided benefits on mood, social support and lung functional capacity.
Vanessa Joaquim Ribeiro Moço, Aline Almeida Gulart, Agnaldo José Lopes, Arthur de Sá Ferreira & Luis Felipe da Fonseca Reis (2023) Minimal-Resource Home Exercise Program Improves Activities of Daily Living, Perceived Health Status, and Shortness of Breath in Individuals with COPD Stages GOLD II to IV	A quasi-experimental (before-and-after) study	The intervention was carried out on 45 patients with COPD degrees II to IV with physical exercise activities at home (Home Exercise) in the form of gymnastics for 2 months and 3 times a week consisting of breathing exercises, stretching, muscle strength, balance training and aerobic training. The results showed an increase in ADL-Giltre (59.8%), an increase in FEV1/FVC (59.8 + 6.9%), mMRC (p=0.09) and CAT (p=<0.001). Individuals can benefit from HE performed independently and with minimal resources, improving quality of life (HRQoL).
Carlos Llamas-Saez, Teresa Saez-Vaquero, Rodrigo Jim´enez-García, Ana Lopez-de-Andres, David Carabantes-Alarcon, Jos´e J. Zamorano-Leon, Natividad Cuadrado-Corrales, Ricardo Omana-Palanco, Javier de Miguel Diez, NapoleonP´erez-Farinos (2023) Physical activity among adults with chronic obstructive pulmonary disease in Spain (2014–2020): Temporal trends, sex differences, and associated factors	*cross-sectional and case–control.*	Conducted on COPD patients aged 40 years and over with physical activity walking two or more days a week and obtained results that increased significantly over time (63.4% - 69.9%), based on male gender more do more physical activity than women, younger age, higher education level, self-perception of health, no comorbidities, obesity and smoking influence the activity patterns carried out by COPD sufferers
Dario Kohlbrenner, Noriane A Sievi, Oliver Senn, Malcolm Kohler & Christian F Clarenbach (2020)	RCT	The program was three months and continued within a year, combining physical activity counseling and pedometer measurements, carrying out usual care

Long-Term Effects of Pedometer-Based Physical Activity Coaching in Severe COPD: A Randomized Controlled Trial		interventions with walking and treatment with pedometer measurements in 74 COPD patients. The results showed that there was no difference in steps after 12 months between groups (p=547.33), it did not reduce the decline in physical activity in patients with moderate, severe and very severe COPD. This is influenced by the low level of intervention response to the combined program
Samuel De Bontridder, Jean-Louis Corhay, Christel Haenebalcke, Frederic Fievet, Isabelle Etienne & Eef Vanderhelst (2021) Correlation of symptoms and physical activity level in chronic obstructive pulmonary disease patients: results from the observational SPACE study	*observational prospective, cross-sectional study*	The research was conducted on 102 COPD patients in Belgium with an average age of 67 years with the prevalence and severity of respiratory symptoms throughout the day by assessing patterns of daily physical activity levels by measuring patterns of physical activity levels (PALs). The results showed that stable COPD patients with low PALs showed increased respiratory symptoms throughout the day (85%), compared to patients who were more active in PALs.
Janet L Larson, PhD, RN, FAANa, Katelyn E Webster, BSN, RN (2023) Feasibility and Acceptability of Active for Life with COPD, an Intervention to Increase Light Physical Activity in People with COPD	RCT	The research was conducted on 170 COPD patients by walking for 6 minutes, then measuring x-ray absorptiometry, physical function and physical composition. The results showed that there was a relationship between disease severity, appendicular muscle mass, total body fat mass, physical function, gender and exercise capacity with FEV p=<0.001, walking distance p=0.001.

Based on Table 1, the review of eight articles revealed that walking was the most common physical activity intervention, with variations in duration and intensity across studies. One article focused on light physical activity training and increasing self-efficacy, while another highlighted independent physical activity at home, including aerobic exercises, deep breathing exercises, and muscle strength training. Three articles discussed physical activity interventions specifically for the elderly. Furthermore, three studies measured intensity, duration, and level of physical activity, noting that these factors were influenced by body composition, muscle mass, gender, and sociodemographic variables. One article assessed physical activity based on symptom severity and physical activity capacity levels (PALs), another examined Tai Chi breathing exercises with cognitive and psychosocial functions, and one article described a physical activity program incorporating pedometer-based counseling.

DISCUSSION

Factors Influencing Physical Activity

Physical activity (PA) is a multifaceted behavior influenced by a wide array of socio-demographic, individual, psychological, socio-cultural, and environmental factors (Ribeiro Moço et al., 2023; Xiang et al., 2022). Patients with chronic obstructive pulmonary disease (COPD) typically exhibit low levels of PA, characterized by significant reductions in duration, intensity, and frequency (Oliveira et al., 2021; Todoroff & Berry, 2023; Xiang et al., 2022). Studies have shown that female patients tend to expend less energy on PA compared to males (Llamas-Saez et al., 2023), though they often demonstrate higher adherence and motivation when participating in PA programs (Llamas-Saez et al., 2023). The effectiveness of PA decreases with advancing age, lower educational levels, smoking, comorbidities, mental health disorders, and obesity (Llamas-Saez et al., 2023). Middle-aged and elderly women, in particular, are encouraged to engage in specific activities such as walking, using chairs while sitting, and participating in group activities to boost self-efficacy and PA levels (Kraemer et al., 2021; Ribeiro Moço et al., 2023). Smoking, linked to unhealthy lifestyles, is associated with decreased PA, while comorbidities like heart disease and stroke further diminish PA levels. Fear of dyspnea, advanced age, and lack of motivation are major barriers preventing COPD patients from being more active (De Bontridder et al., 2022). Daily clinical

symptoms such as dyspnea, fatigue, anxiety, and depression contribute significantly to the low levels of PA (Horner et al., 2023; Oostrik et al., 2023).

Body composition and muscle mass also play critical roles in influencing PA in COPD patients (Oliveira et al., 2021; Todoroff & Berry, 2023). Research indicates that while obesity can enhance muscle mass and strength, it can also worsen lung mechanics and cause dyspnea, thereby limiting PA (Todoroff & Berry, 2023). Lean body mass index, which better reflects muscle mass, correlates more strongly with exercise capacity, underscoring the importance of body composition assessment (Llamas-Saez et al., 2023). Disease severity and frequent exacerbations further diminish muscle strength and mass, reducing physical function. However, interventions like walking and daily PA can improve muscle mass, strength, and overall lung function (Oliveira et al., 2021; Todoroff & Berry, 2023).

Types of Exercise, Counseling Programs, and Physical Activity Assessments

COPD patients experience declining PA levels from the early stages of the disease, which can worsen over time (Xiang et al., 2022). Although pulmonary rehabilitation effectively improves exercise capacity and quality of life, it does not necessarily increase daily PA duration (Larson et al., 2021). Research indicates that regular light physical activity (LPA) in elderly COPD patients reduces mortality risk by 14%, lowers the risk of hospitalization due to exacerbations, and slows the decline in lung function (Larson et al., 2021). LPA interventions typically involve walking for six minutes, engaging in preferred standing activities, and adjusting intensity and duration based on symptoms and exertion levels, performed for 30 to 60 minutes daily. Such activities are suitable for patients with varying degrees of COPD severity and can enhance long-term PA, self-efficacy, quality of life, and health-related functional abilities (Kohlbrenner et al., 2020; Larson et al., 2021).

The ease and affordability of PA interventions make them attractive for all COPD sufferers. Inadequate PA leads to dyspnea and diminished quality of life. Bontridder et al. (2021) found that the symptom burden in COPD is high (>85%) and exacerbates with increasing airflow obstruction, necessitating effective symptom relief programs across all disease stages. Home exercise programs are the most accessible PA for COPD patients, using household items like chairs and weights (1 to 4 kg) for training. These programs include walking for six minutes, deep breathing, stretching, muscle strengthening, balance training, and aerobic exercises (Ribeiro Moço et al., 2023). Home exercise can be conducted independently using guidebooks or under healthcare providers' supervision via telemonitoring, improving functional capacity, ADL, and quality of life (HRQoL) for COPD patients (Ribeiro Moço et al., 2023; Silva et al., 2021).

COPD's complex clinical presentation often includes higher anxiety and depression levels compared to the general population. Studies show a correlation between anxiety and dyspnea, contributing to disability and functional decline (Kraemer et al., 2021). Tai Chi, a mind-body approach, addresses the physiological and psychosocial symptoms of COPD. This practice integrates low-impact PA, strength training, procedural control, and various breathing techniques (Kraemer et al., 2021). Tai Chi breathing exercises include body renewal with relaxation, full breathing with mental focus, diaphragmatic-abdominal breathing, and balloon breathing, typically over 12 weeks, targeting elderly COPD patients with physical limitations. Although Tai Chi does not significantly improve functional capacity and forced vital capacity (FEV/FVC), it benefits physiological and psychosocial symptoms, exercise tolerance, anxiety, depression, and HRQoL (Kraemer et al., 2021).

COPD patients face the greatest symptom burden in the morning, though symptoms persist throughout the day, limiting PA (De Bontridder et al., 2022). To evaluate the prevalence and severity of symptoms and their impact on PA levels, the patterns of physical activity levels (PALs) assessment can be used, combining the COPD Assessment Test (CAT) and the Medical Research Council (mMRC) dyspnea scale questionnaire. Studies indicate that over 85% of stable COPD patients experience daily respiratory symptoms, exacerbated by airflow obstruction and insufficient PA levels (De Bontridder et al., 2022). Long-term PA program effectiveness can be enhanced by integrating PA counseling and maintenance interventions using pedometers and accelerometers (Kohlbrenner et al., 2020). This approach, involving motivational support, guidebooks, goal setting, planning, and self-monitoring of steps, exercise duration, and intensity, can significantly boost PA adherence and self-management in COPD patients. However, in patients with severe COPD, these programs may not substantially impact disease progression due to the low intervention response, affecting various dimensions of physical activity, exercise capacity, and quality of life (Kohlbrenner et al., 2020).

CONCLUSION

Chronic obstructive pulmonary disease (COPD) with its complex symptom burden significantly impacts patients' physical activity. Inadequate PA exacerbates the condition, but COPD patients can engage in independent home exercises or integrated training with healthcare guidance. Activities such as walking, aerobics, breathing exercises, Tai Chi, and muscle stretching, along with daily activities (ADL), are suitable for COPD patients of all severity levels. Adherence to physical activity regimens can improve lung function, alleviate symptoms, and maintain long-term activity. Tailored physical activity training based on patients' severity, intensity, duration, and condition has proven effective in enhancing health status and quality of life for COPD patients.

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