

# Adherence to Exercise among COPD (Chronic Obstructive Pulmonary Disease) Patient- Barriers and Facilitators

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## ABSTRACT

Chronic obstructive pulmonary disease is a common inflammatory lung disease characterized by persistent respiratory symptoms and airflow limitation. There is compelling evidence that regular exercise can lower the chance of developing several chronic diseases. Although it helps in reducing COPD symptoms and improve quality of life, which is highly beneficial for COPD patients, there are still several reasons for barriers to adherence to exercise in COPD patients which further affects their health. Most COPD patients are typically compelled to minimize exercise and adopt sedentary lifestyles due to decrease activity related dyspnea and exercise tolerance.

Relevant literature was obtained from platforms such as Google Scholar and PubMed. For thorough retrieval, the Boolean logic operators "AND, OR NOT" were applied. All pertinent keywords, mesh terms, and other index terms were searched for in relation to "barriers," "facilitators," "chronic obstructive pulmonary disease" and "exercise" which were then utilized to build the search strategy.

This review found that exercise improved dyspnea, quality of life, lessened depression, enhanced cognitive and neurobehavioral function in COPD patients, and shortened hospital stays and COPD exacerbations. Many factors act as barriers of adherence to exercise among COPD

patients, such as self, environment, health and psychosocial. While numerous factors such as positive feedback, support from family, self-initiation, etc. act as a facilitator of adherence to exercise among COPD patients.

**Keywords:** Chronic Obstructive Pulmonary Disease, barriers, facilitators, benefits of exercise.

## INTRODUCTION

Chronic bronchitis and emphysema are two illnesses classified as Chronic Obstructive Pulmonary Disease (COPD) due to their shared characteristic of persistent airway blockage. Airway obstruction, caused by distributed narrowing in the airways, increases resistance to airflow. Typically, irreversible, these conditions result in frequent coughing with mucus production, wheezing, and shortness of breath, particularly during physical activity. Additional symptoms may include chest tightness, weight loss, weakness in lower limb muscles, and swelling in the ankles, feet, and legs.

Exercise is a form of physical activity that is intentional, repetitive, planned, and structured, with the goal of enhancing or maintaining various aspects of physical

fitness. It plays a crucial role in improving the health of COPD patients. While exercise alone cannot restore lung function, it effectively reduces COPD symptoms and enhances quality of life, offering significant benefits to COPD patients. However, despite the availability of multiple physical exercises, there are several barriers that hinder adherence to exercise in COPD patients, such as advancements in technology and challenges related to urban transportation, among others. These barriers can demoralize COPD patients and impede their pursuit of a healthy lifestyle. This review article aims to explore the various barriers faced by COPD patients in performing physical activity and understand the facilitators that can promote exercise adherence in these patients.

### BENEFIT OF EXERCISE

Most clinical trials of exercise training in COPD have concentrated on strengthening the lower limb muscles, either alone or in combination with strengthening the arms or respiratory muscles, because exercise limitation typically starts with difficulty in walking. This leads to improvement in dyspnea and quality of life in relation to

one's health. Exercise that is aerobic in nature lessens depression and enhances cognitive and neurobehavioral function in COPD patients. And most importantly, it shortens hospital stays and COPD exacerbations<sup>(1)</sup>. Pursed lip exercise causes significant improvement in tidal volume ( $p < 0.001$ ), inspiratory time ( $p = 0.007$ ), and total respiratory time ( $p < 0.001$ )<sup>(2)</sup>. Another study conducted in UK found that physical activity behavioral modification interventions alongside physical rehabilitation improve the experiences of exercise in patients with advanced COPD (by 1566 steps/day: 95% CI 681 to 2357,  $p = 0.001$ )<sup>(3)</sup>.

Exercise programs help them to meet people which is positive social benefits. It helps them to come out of their houses and talk to people as they participate in activity which has a positive impact of improving motivation and self-confidence<sup>(4)</sup>.

### BARRIERS TO EXERCISES

The barriers that hinder individuals from carrying out their regular activities have been categorized into four main groups: health-related barriers, environmental barriers, self-related barriers, and psychosocial barriers<sup>(5)</sup>.

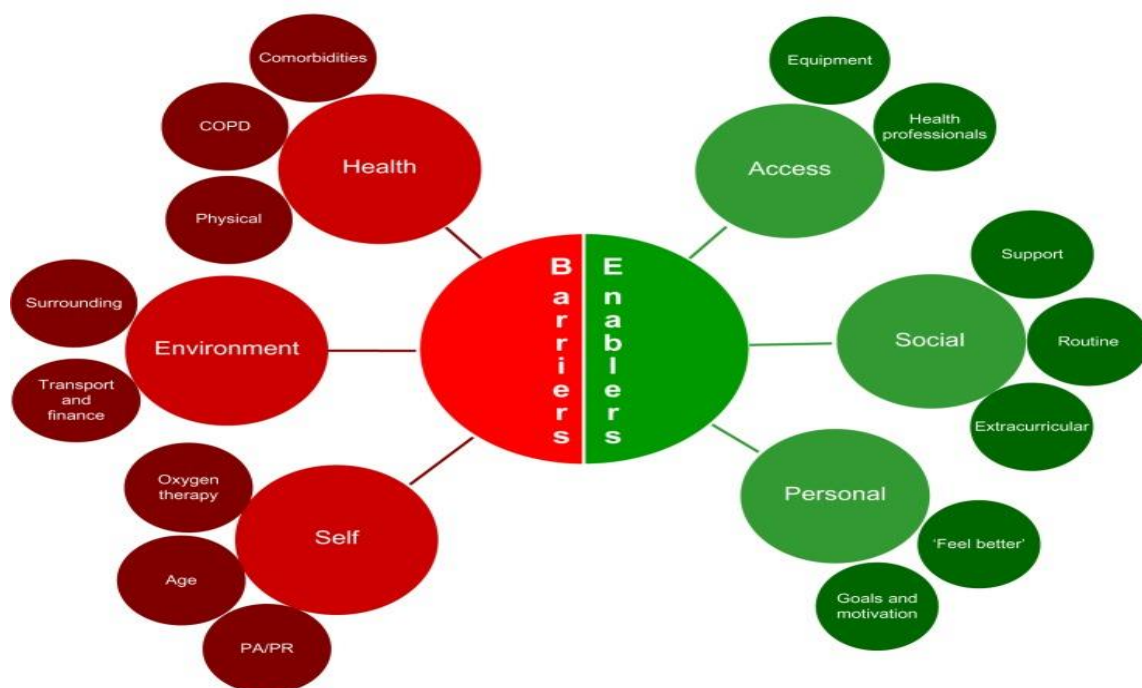


Fig 1: Barriers to exercise in COPD patients. (Figure used from the study titled- Barriers to and enablers of physical activity in patients with COPD following a hospital admission: a qualitative study- Olivia Thorpe, Saravana Kumar, and Kylie Johnston)<sup>(6)</sup>.

## **BARRIERS RELATED TO HEALTH**

Patients with COPD exhibit lower daily activity levels compared to healthy individuals, regardless of the disease stage. This lack of activity acts as a barrier to exercise. As the disease progresses from GOLD (Global initiative for chronic obstructive lung disease) Stage III to stage IV, patients experience a reduced capacity and quality of life. Expiratory flow limitations are the main pathophysiological abnormality during exercise in COPD. The presence of comorbidities, particularly cardiovascular disease, and diabetes, which are more prevalent among COPD patients, further contribute to the largest reduction in exercise capacity. These comorbidities result in increased dyspnea, poorer exercise capacity and longer periods of hospitalization when compared to individuals without comorbidities. Anemia is also associated with worsened dyspnea, decreased exercise ability, and lower quality of life in COPD patients. Individuals with COPD who also have osteoporosis, decreased bone mineral density, and bone deterioration face an increased risk of fractures. This exacerbates the condition, leading to decreased lung function and reduced levels of physical activity. Patients with severe dyspnea often limit their regular physical exercise to alleviate their dyspnea symptoms, which creates a vicious cycle of decreased physical activity, muscle atrophy, and disease progression. The severity of COPD, along with physical health or status, constitutes significant health-related barriers. Muscle mass loss, known as muscle wasting or muscle atrophy, is a common issue among COPD patients and can serve as a significant barrier to exercise. The loss of muscle mass in COPD is primarily attributed to a combination of factors, including decreased physical activity, systemic inflammation, oxidative stress, hormonal imbalances, and malnutrition.

COPD patients often experience a sedentary lifestyle due to symptoms such as shortness of breath and fatigue, leading to reduced muscle usage and subsequent muscle

wasting. Additionally, the chronic inflammation and oxidative stress associated with COPD contribute to muscle protein breakdown and impair muscle regeneration and growth. There is a significant association between peripheral muscle strength and exercise performance ( $\beta=0.42$ , 95% CI 0.09 to 0.84,  $p = 0.019$ )<sup>(7)</sup>.

Muscle wasting not only affects the respiratory muscles involved in breathing but also impacts peripheral skeletal muscles, such as those in the limbs. These peripheral muscles play a crucial role in mobility, balance, and overall physical function. As muscle mass decreases, COPD patients may face limitations in their ability to engage in physical activities and experience difficulties in performing daily tasks, further perpetuating a sedentary lifestyle. A study conducted among 125 COPD patients also highlighted reduced exercise capacity in relation with decreased mean values for respiratory parameters and the calculation i.e., FEV1 ( $r=0.29$ ,  $p= 0.035$ ), FVC ( $r= 0.32$ ;  $p=0.045$ ) and FEV1/FVC ratio ( $r= 0.32$ ;  $p= 0.007$ ) which can be due anatomical and physiological obstruction of airway causing disturbance in effective gas exchange. The plausible mechanism could be bronchial spasm, decreased parenchymal support and inflammation of airway due to poor recoiling of lungs, signifying muscular fatigue in COPD patients<sup>(8)</sup>.

The loss of muscle mass in COPD patients can result in decreased strength, endurance, and exercise capacity, making it more challenging for individuals to adhere to regular exercise programs. Weak muscles may contribute to increased perceived exertion during physical activity, leading to feelings of fatigue and breathlessness. Moreover, muscle weakness can also affect balance and increase the risk of falls, which further discourages engagement in physical exercise.

## **BARRIERS RELATED TO THE ENVIRONMENT**

Environmental barriers encompassed various impediments that affected exercise

adherence in COPD patients. These barriers included unfavorable weather conditions that made it challenging to exercise and adhere to a regular regimen. Factors such as cold temperatures, strong winds, and high humidity significantly reduced the number of steps taken by patients each day. Furthermore, environmental barriers included allergens such as house dust and pollen, which could trigger respiratory symptoms and discourage physical activity. Inadequate training availability and lack of exercise infrastructure were additional challenges faced by COPD patients. Limited access to suitable exercise facilities or programs hindered their ability to engage in regular exercise routines. In a qualitative study conducted, it was found that 80% of COPD patients and 30% of the control group ( $p < 0.001$ ) had found that there is no excess to exercise facilities or no resources to exercise, 63% of COPD and 55% control group with lack of will power and 53% patient and 32.5% control by social influence i.e. no family to exercise with or no one to encourage ( $p < 0.001$ )<sup>(9)</sup>.

Transportation challenges posed a significant environmental barrier for COPD patients. Difficulties in accessing transportation, especially for patients receiving home oxygen therapy, could restrict their ability to travel to exercise facilities or participate in group exercise sessions. Additionally, the cost associated with transportation, particularly for those with limited financial resources, further compounded this barrier<sup>(10)</sup>.

### **BARRIERS CONNECTED TO SELF**

Engaging in regular physical exercise becomes increasingly challenging due to numerous factors, including difficulties with exercise, age-related changes in skeletal muscle mass, and cardiovascular fitness. These factors contribute to a decline in independence and make it harder for individuals to maintain an active lifestyle. Additionally, there are gender differences in exercise behavior, with women typically exercising less vigorously and spending less

time engaging in moderate to intense physical activity compared to men. Women, especially those who are sedentary, are prone to experiencing bone loss even before reaching menopause.

Lack of access to oxygen therapy can also serve as a barrier to exercise for individuals with COPD. The fear of becoming breathless during physical exertion can be overwhelming and may demotivate patients, leading to reduced participation in exercise. This fear stems from the uncontrollable sensation of breathing difficulties, causing individuals to perceive exercise as a potential trigger for breathlessness. In one study, the top three barriers preventing COPD patients from being more physically active are fear of shortness of breath, aging, and lack of enthusiasm. Research findings indicate that individuals with COPD who experience hospital readmissions due to acute exacerbations demonstrate significantly lower walking time after one month compared to patients who do not require readmission. Individuals who were hospitalized for an acute exacerbation in the previous year exhibit less improvement in physical activity compared to those without a hospitalization history in the preceding year<sup>(6)</sup>.

Furthermore, several other barriers contribute to a lack of regular exercise. These include a shortage of time, insufficient enjoyment of exercise, low self-motivation, dislike of physical activity, lack of self-confidence in one's physical abilities, fear of injury or recent injury, inadequate self-management skills, limited support and encouragement, and a lack of belief in one's capacity to engage in physical activity.

### **BARRIERS RELATED TO PSYCHOSOCIAL**

Anxiety is associated with decreased exercise performance, overall health status, and increased feelings of breathlessness among COPD patients. Concurrent depression in COPD patients has been shown to contribute to worsened health outcomes, functional impairment, and lower treatment

compliance. The psychological impact of COPD, including anxiety, depression, and feelings of embarrassment, significantly affects the motivation of COPD patients to engage in exercise. COPD patients may struggle to find the inner drive and determination to initiate and maintain a regular exercise routine. This can be influenced by several factors, including the physical limitations imposed by the disease, perceived exertion and breathlessness during exercise, and the belief that exercise may exacerbate symptoms. A study has shown the most significant barrier towards exercise was low motivation ( $p < 0,001$  and  $p = 0,009$ ), co-morbidity ( $p = 0,034$  and  $p = 0,016$ ), and fear of breathlessness ( $p < 0,001$ )<sup>(11)</sup>.

Lack of infrastructure, such as the availability of suitable exercise facilities or programs, can act as a barrier to exercise for COPD patients. Limited access to exercise resources makes it challenging for individuals to find appropriate and convenient opportunities for physical activity.

Social influences also play a role in exercise adherence for COPD patients. Lack of support from family, friends, or healthcare providers, as well as societal attitudes towards exercise and COPD, can contribute to reduced motivation and engagement in physical activity<sup>(10)</sup>.

## **FACILITATORS**

In this review facilitators signify an aid that acts as motivation for COPD patients. Encouragement, companionship, professional support, goal setting, personal characteristics, availability of a range of exercise options, ease of access, perception of benefits to attending, structured and convenient programmed components, being retired, social support, and the summer season are some factors that encourage exercise among COPD patients. They were

self-motivated, aware of the advantages, confident and strongly influenced by other COPD patients<sup>(12)</sup>.

Figure 2 shows the components that facilitates adherence to exercise through seven sub-themes within the three analytical themes - beliefs, social support, and environment - among patients with COPD, that may have an impact on physical activity after pulmonary rehabilitation. People's intentions and motivation to maintain physical activity after pulmonary rehabilitation are influenced by their beliefs about the value of exercise, their experiences before and after pulmonary rehabilitation, their awareness of improvements, and their level of confidence. Individuals' journeys after pulmonary rehabilitation for COPD patients were significantly influenced by other people.

In addition to relating to those who are in comparable circumstances, it was crucial to have the perception of being cared for, appreciated, and helped within the home and community.

The options for physical exercise after pulmonary rehabilitation varied depending on the environment of the individuals. Additionally, the experiences and strategies people used to successfully build habits after pulmonary rehabilitation were influenced by their experiences in and approach to their physical and social environments.

The perception of ongoing support from healthcare professionals, ongoing peer interaction, the sense of accomplishment attained through self-monitoring and feedback, and opportunities to participate in physical activity maintenance groups after pulmonary rehabilitation were among the key facilitators identified in this review. These factors helped people establish routines and habits<sup>(13)</sup>.

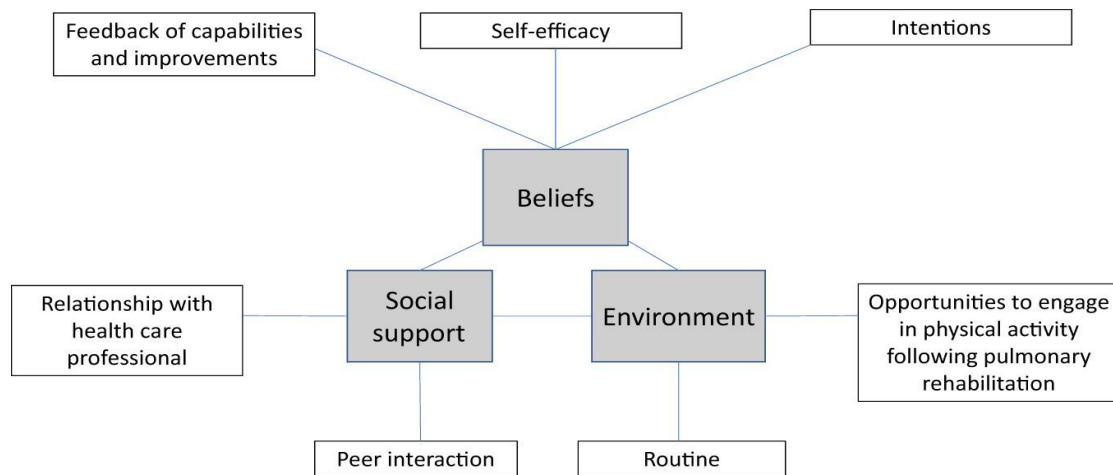


Fig 2. facilitators to exercise in COPD patients. (Figure used from the study title: Facilitators and barriers to physical activity following pulmonary rehabilitation in COPD: a systematic review of qualitative studies- Hayley Robinson, Veronika Williams, Ffion Curtis, Christopher Bridle & Arwel W. Jones)<sup>(13)</sup>.

## CONCLUSION

Overall, individuals with COPD engage in minimal physical exercise, particularly women and older individuals who tend to participate in less physical activity. This highlights that physical exercise for COPD patients is a complex process that is influenced by various health, psychosocial, environmental, and personal constraints. Research findings have shown that there are several factors that may enable people with COPD to participate in physical activity and pulmonary rehabilitation.

Social support involving contact with and participation by family and friends may act as a facilitator for getting out of the house and into social events. Re-establishing daily routine following a hospital admission served as a facilitator for engaging in physical activity. Everyday activities such as shopping and running errands provided opportunities to be physically active and participate in regular exercise. These routine activities of daily living were frequently mentioned by participants as means of incorporating physical activity into their lives. As a result, COPD patients require increased support from nurses to enhance their access to exercise, reducing physical and mental health issues and improving their overall condition. To overcome barriers to exercise, it is important to address the psychological well-being of COPD patients

through appropriate interventions. This may involve incorporating psychological support, such as cognitive-behavioral therapy or counseling, into their overall care plan. Additionally, creating supportive environments, providing education and encouragement, and fostering a sense of self-efficacy can help enhance motivation and improve exercise adherence in COPD patients<sup>(14)</sup>.

## Declaration by Authors

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