

# Effect of Sub Maximal Exercise Training on Exercise Capacity in Patients with Chronic Obstructive Pulmonary Disease

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**Abstract:** *Chronic obstructive pulmonary disease is a heterogeneous condition embracing several overlapping pathological process including chronic bronchitis, chronic Bronchiolitis (small air way disease) and emphysema. Many patients also exhibits systemic component characterized by impaired nutrition, weight loss and skeletal muscle dysfunction. Fear for shortness of breath often results in avoidance of physical activity and therefore enhances exercise intolerance and social isolation of chronic obstructive pulmonary disease patients. Physiotherapy plays a key in multidisciplinary interventions. The purpose of this study is to find out the effect of sub maximal exercise training on exercise capacity in patients with chronic obstructive pulmonary disease. Experimental study design was utilized in this study .Intervention protocol mode is done with sub maximal exercise ,at frequency of 20 minutes/day at 5 days/week at a duration of 4 weeks .intensity has been set at 60 revolution /min ( 85/100x 220-age) .the study was done at pulmonary rehabilitation department Alva's college of physiotherapy at outpatient unit. Twenty subjects of both genders male and female at age group of 20-50 years were divided into groups. Selection criteria on inclusion of the subjects diagnosed as COPD, outpatient rehabilitation based subjects and subjects at pregnancy and Dysnea at rest were excluded. The outcome measurement is done by 6 WMD test. The exercise capacity measured by 6MWD test in patients with COPD and the % of improvement for Group A (Experimental Group) which is treated with sub maximal exercises is 0.079% more than that of Group B (Control group) which is treated with pulmonary rehabilitation. The study concludes that the subjects with COPD are treated with pulmonary rehabilitation usually and in this study it is proved bearing on the results that sub maximal exercise when added to pulmonary rehabilitation can give good improvement in exercise capacity for subjects with COPD.*

**Keywords:** COPD, 6 WMD test, sub maximal exercise, cycle ergo meter

## 1. Introduction

Chronic obstructive pulmonary disease is a heterogeneous condition embracing several overlapping pathological process including chronic bronchitis, chronic bronchiolitis (small air way disease) and emphysema [25]. Many patients also exhibits systemic component characterized by impaired nutrition, weight loss and skeletal muscle dysfunction.

Dyspnoea, impaired exercise tolerance and reduced quality of life are common complaints in patients with chronic obstructive pulmonary disease reduced exercise capacity shows only a weak relation to lung function impairment, other factors, such as peripheral muscle weakness, deconditioning and impaired gas exchange are now recognized as important contributors to reduced exercise Tolerance [19,16].

Reduced exercise capacity and muscle weakness render these patients disabled with a high utilization of health care resources dyspnoea and life threatening exacerbations provoke anxiety in chronic obstructive pulmonary disease [17, 18]. Fear for shortness of breath often results in avoidance of physical activity and therefore enhances exercise intolerance and social isolation of chronic obstructive pulmonary disease patients.

Physiotherapy plays a key in multidisciplinary interventions. Physio therapists aim to improve ventilation for people with respiratory disease and approach this using a variety of techniques [15, 22]. The major interventions commonly used by physiotherapists are breathing exercises, broncho

pulmonary hygiene techniques and physical training for peripheral and respiratory muscles.

Pulmonary rehabilitation programmes aim at reversing this deleterious situation in terms of improvements in exercise capacity, activities of daily living quality of life, perhaps survival. As the impairment of exercise tolerance is a common problem in chronic obstructive pulmonary disease patients, exercise training is considered an important component of the treatment" [2, 7].

During exercise training dyspnoea is a common problem and the modified borg's scale (MBS) is a tool that had the potential to provide quick, easy, and rapid information about a patient's subjective state of dyspnoea. Among several modalities available for measurement of exercise capacity the 6 MWT is easy to administer, better tolerated and more reflective of activities of daily living than the other walk test [23, 24]. 6 minute walk test and measurement of breathlessness using modified Borg's scale 12 were used in the study to assess exercise capacity before and after a sub maximal table. It was found that is there is significant increase in exercise capacity in patients after exercise training.

## 2. Methodology

Twenty subjects were included in this study who were divide into two groups an experimental group and a control group each of 10 in a group. Selection criteria included at Age group – 20-50 years, Subjects diagnosed as COPD awarding to GOLD criteria, Outpatient rehabilitation based subjects.

Both male and female genders .subjects with Dyspnea at rest, Pregnancy, unco-operative subjects, Current chest pain, Active neurological and orthopedic diseases

**2.1 Procedure**

All subjects fulfilling the inclusion criteria will be participating in the study. A written consent will be taken from all subjects prior to participation. On getting the consent from the patient and they will be selected and their detailed case history will be taken. Exercise capacity of patient will be examined, after 6 minute walk test (pre training) subjects were divided into 2 groups of 10 each.

**2.2 Training Procedure**

**2.2.1 Group – An Experimental group:**

Submaximal exercise rate of each patient should be calculated using their age  $[85/100 \times 220 - \text{age}]$  submaximal exercise using cycle ergometer will be given for 20 minutes/day, 5 days/ week for a period of 4 weeks.

These 20 minutes will be divided into 4 sets. Each set containing 5 minute cycling followed by 2-4 minute rest. Pedaling of cycle is at the rate of 60 revolutions/ minute patient is under pulse oxymeter during their training. This treatment is given along with pulmonary rehabilitation. After 4 weeks the same therapist will recheck the exercise capacity by recording after 6 minute walk test (post training)

**2.2.2 Group- B Control group**

Treatment is done with pulmonary rehabilitation alone all the pre and post test exercise capacity measures will be compared by the same therapist after 4 weeks.

**3.Statistical Analysis**

The acquired data is analyzed for results. The exercise capacity of patients with COPD is measured by 6MWD test and the raw data is analyzed accordingly.

**3.1 Exercise capacity by 6MWD test for group A experimental group**

The average of pre test score = 385  
 The average of post test score = 429.9  
 The average percentage of improvement is 0.104

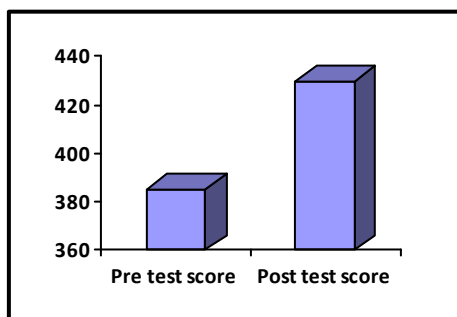


Figure 1: 6MWD –Group A

**3.2 Exercise capacity by 6MWD test for group B experimental group**

The average of pre test score = 380.1  
 The average of post test score = 390  
 The average percentage of improvement is 0.0253

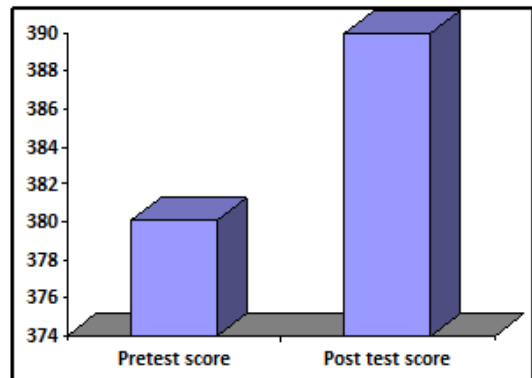


Figure 2: 6MWD –Group B

**3.3 Comparison of exercise capacity by 6MWD test for two groups**

% of improvement for Group A = 0.104  
 % of improvement for Group B = 0.025  
 $\therefore$  % of improvement in Group A is 0.079% better than Group B

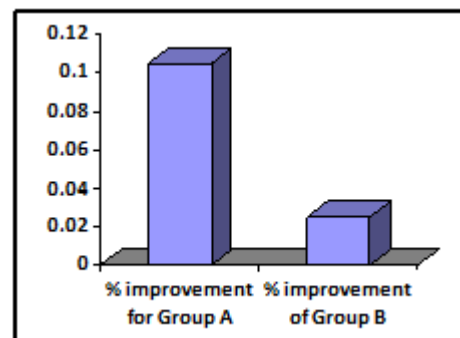


Figure 2: 6MWD –Group A Vs Group B

**3.4 Results**

The exercise capacity measured by 6MWD test in patients with COPD and the % of improvement for Group A (Experimental Group) which is treated with submaximal exercises is 0.079% more than that of Group B (Control group) which is treated with pulmonary rehabilitation.

**4. Conclusion**

The subjects with COPD are treated with pulmonary rehabilitation usually and in this study it is proved bearing on the results that sub maximal exercise when added to pulmonary rehabilitation can give good improvement in exercise capacity for subjects with COPD.

**5. Discussion**

Exercise training has always proven its benefits in improving exercise tolerance/ capacity therefore even in chronic

obstructive pulmonary disease, sub maximal exercise training will demonstrate better exercise tolerance. Sub maximal exercise training will help to lower, rates of perceived exertion, thereby improving quality of life.

This study will help us determine, if sub maximal exercise training using cycle ergo meter is beneficial in improving exercise capacity in chronic obstructive pulmonary disease patients. This will help us to design home program, for COPD patients who have such home facilities. And now it is proved in this study to use sub maximal exercise along with pulmonary rehabilitation for patients with COPD.

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