

## Comparison of Functional Capacity in Moderate and Severe COPD Subjects

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### Abstract

**Introduction:** COPD is the respiratory disease that affects almost 24 million people and this prevalence is about to increase 32 billion till 2020 in India. It is the disease causing disability and is the fourth leading cause of death in India affecting mostly men, but 40% are women in India. The prime cause is smoking and rest is pollution. It is a slowly developing disease with the main feature of dyspnea and cough with or without expectoration, which can be treated with Breathing exercises. So, this study is designed for a better protocol, which can help patients of COPD reliving dyspnea and other features of COPD, improving their health quality. **Methodology:** A sample of 30 COPD patients was taken on the basis of their symptoms of dyspnea and other features. 15 patients were grouped under Dyspnea Reliving Position (DRP) on the basis of their resting dyspnea. The other group was of rest 15 patients, having no resting dyspnea, were grouped under Paced Walking (PW) group without dyspnea reliving position. Group DRP was taught ACBT (Active Cycle of Breathing technique) in dyspnea reliving position. Group PW was taught ACBT without dyspnea reliving position. Data was collected in the form of outcome variables- SPO<sub>2</sub>, BHT (Breath Holding Time), PEFR (Peak Expiratory flow Rate Meter), 6MWT (Minute Walk Test), HR (Heart Rate) and BRPE (Borg Rate of Perceived Exertion) score. ACBT was done 2 times a day for 3 days a week. Data was collected by ANOVA Test and Tukey Kamar's Post Hoc Test as appropriate. **Result:** The total outcome variables were shown to be improved after 4 weeks of pulmonary rehabilitation program. A significant increase in SPO<sub>2</sub>, PEFR, 6 MWT distance and Breath holding time was noted in both the groups. A significant decrease in BRPE score and Heart rate was shown in both the groups. **Discussion/Conclusion:** 4 weeks of exercise program showed a significant improvement in the outcome variables of SPO<sub>2</sub> after ACBT given in both groups of COPD patients, which shows a significant improvement by new protocols of ACBT.

**Keywords:** COPD; DRP; ACBT; PW; SPO<sub>2</sub>; PEFR; 6MWT.

### Introduction

Chronic obstructive pulmonary disease (COPD) is the condition of major consideration as it is morbid, with the risk of death of people worldwide suffering from it. COPD or Chronic Obstructive Pulmonary Disease is the disease of the airways that cause decreased function of lungs with dyspnea,

cough and sputum production [1]. According to a study in 2011; it is ranked as a fourth leading cause of death. Over 3 million people die from it [2]. Main cause is tobacco smoking with the contributing factors of pollution and to some extent, the genetics [3]. There are various treatments of COPD available. Most common are bronchodilators, oxygen therapy, and other alternatives. These mostly are for reliving symptoms and improve patients Quality of Life [4,5].

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Respiratory physiotherapy also plays an important role in the treatment of COPD in reliving it's symptoms as dyspnea and cough with sputum production [6]. Airway mucus hyper secretion is a cardinal feature of COPD. Mucus hyper secretion, implicit in term chronic bronchitis, is one of the disorder order of the lungs in COPD.

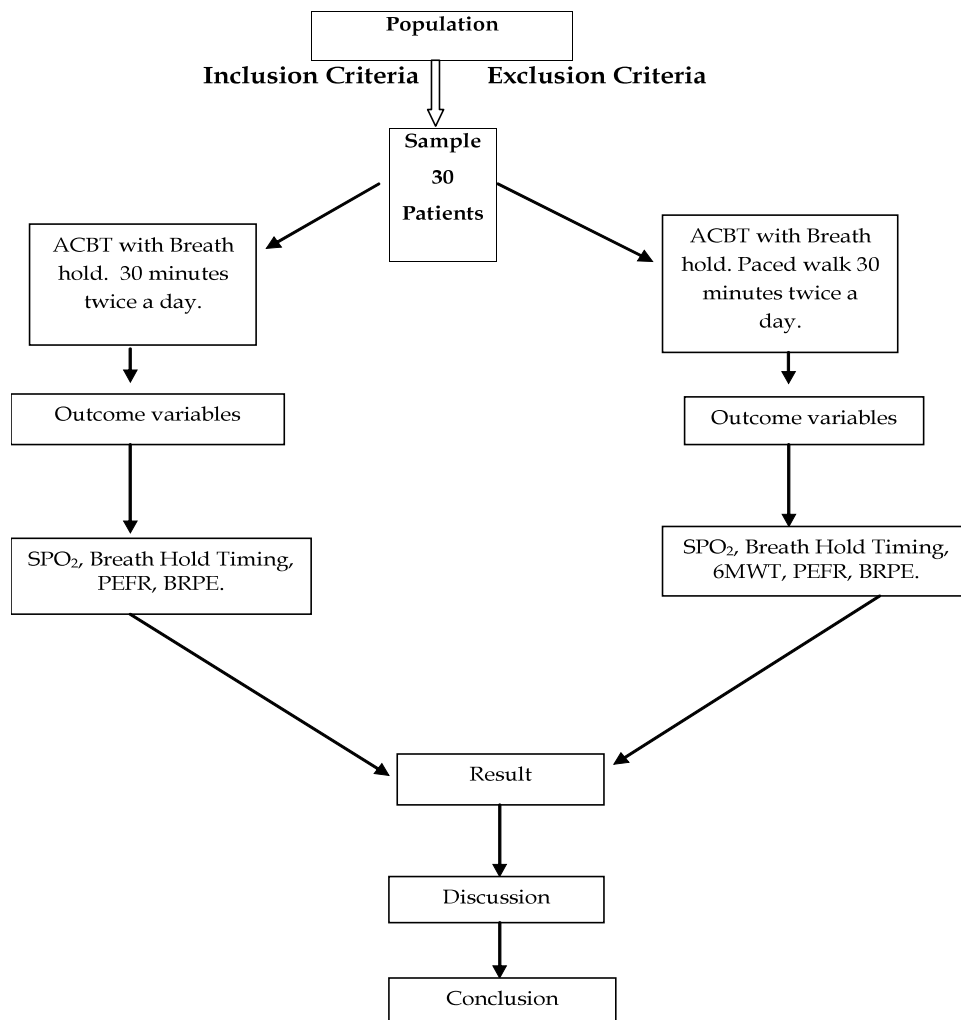
The increased mucus is associated with goblet cell hyperplasia and submucosal gland hypertrophy.

The number of ciliated cells and ciliary length is decreased in patient with chronic bronchitis [7]. These abnormalities coupled with mucus hyper secretions are associated with reduce mucus clearance and airway obstruction. Retained airway secretions can form mucous plugs and bronchial casts that cannot be expelled by coughing. Airway plugging causes impaired ventilation, resulting in lower ventilation - to-perfusion ratios. Increased airway resistance to airflow and air trapping result in hyperinflation of the chest and inspiratory loading of the respiratory muscles, leading to fatigue [8].

Pulmonary rehabilitation programs have been well established in recent years for chronic bronchitis. Pulmonary rehabilitation is given with several goals like to decrease subjective dyspnea, improve Breathing pattern, increase functional endurance, increase strength and endurance of respiratory muscles, improve education regarding disease process, enhance respiratory function and prevent further de-conditioning and improve quality of life [9].

### Methodology

In this experimental study, a sample size of 30 patients was taken from the Chest Ward in the HIHT hospital, with the inclusion criteria of COPD and both genders, of the age between 40- 70 years. The patients were divided into two groups, DRP and PW group, containing 15 patients each. The DRP group was taught ACBT in Dyspnea Reliving Position. The PW group was taught ACBT in semi-fowler position. The ACBT was given two times a day in both the groups, one morning and one evening session and each session was of 30 minutes. The functional capacity was then assessed in DRP group with SPO<sub>2</sub> levels, PEFR, BHT and BRPE variables. The functional capacity of PW group was assessed with SPO<sub>2</sub> levels, PEFR, BHT, BRPE and the 6 MWT distance variables. The data was analyzed using ANOVA test and Tukey Kamar’s Post Hoc Test wherever appropriate.



**Result of DRP group**

*SPO<sub>2</sub> Variable*

The Comparison of SPO<sub>2</sub> variable of the DRP group having Mean± SD on Day 1 is 90.000±2.070, on Day 2 is 91.667±2.743 and on Day 3 is 93.467±2.642. The F value is 7.199 and P-value is 0.0021 which is very significant.

*BHT Variable*

The comparison of BHT variable of DRP group with Mean±SD on Day1 is 6.067±2.187, on D2 is 7.067±2.120 and on D3 is 8.600±1.920. The F value is 7.199 and P value is 0.0021 which is significant.

*PEFR Variable*

The comparison of PEFR variable of DRP group with Mean± SD on Day1 is 5.667±1.397, on Day 2 is

Fig. 1:

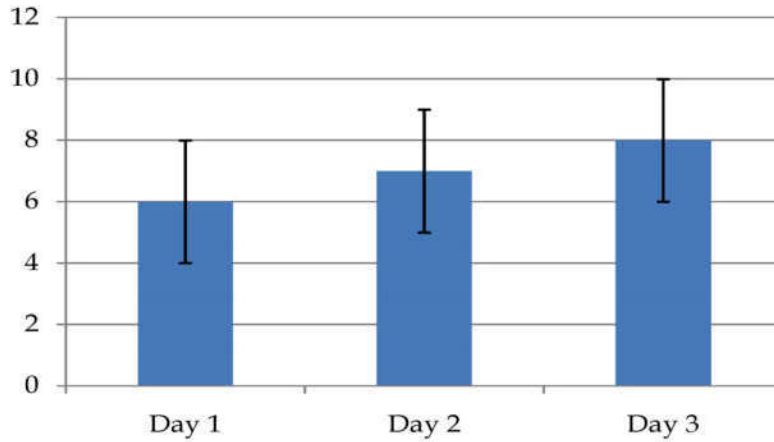


Fig. 2:

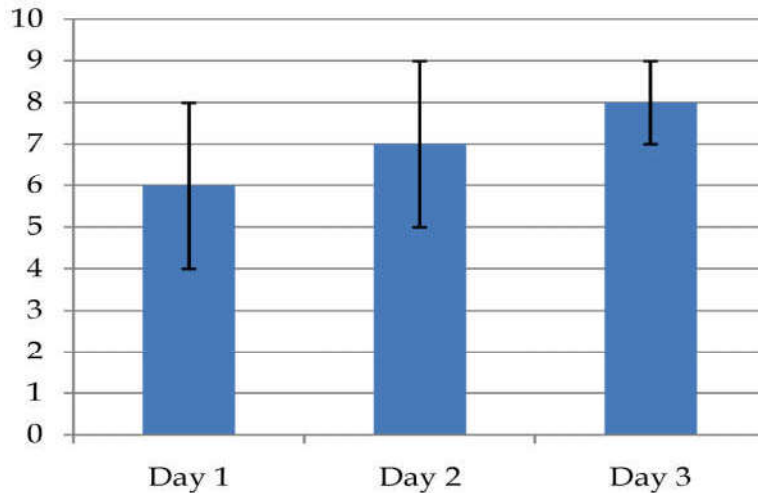
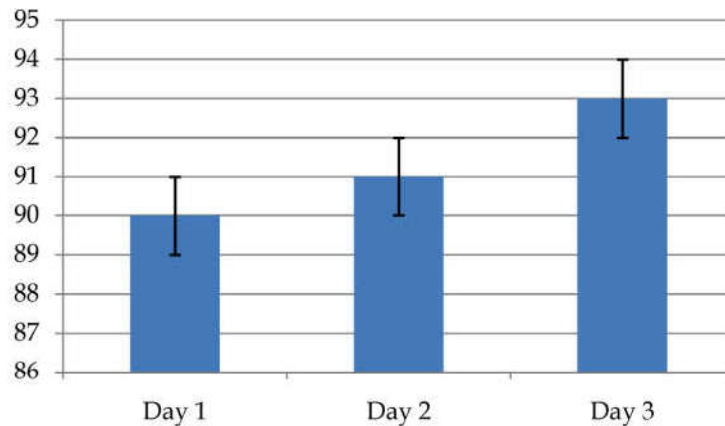


Fig. 3:



4.000±1.134 and on Day 3 is 2.933±0.9612. The F value is 5.967, and P value is 0.0052, which is significant.

*BRPE Variable*

The comparison of BRPE variable of DRP group having Mean± SD, on Day1 is 5.667 ± 1.397, on Day 2 is 4.000 ±1.134 and on Day 3 is 2.933 ±0.9612. The F value is 20.519, and P value is 0.0001 which is significant.

*HR Variable*

Comparison of HR variable in DRP group having Mean± SD on Day1 is 84.333±3.697, on Day 2 is 81.933± 3.390 and on Day 3 is 78.400±3.225. The F value is 11.272 and the P value is 0.0001, which is considered extremely significant.

**Result of PW Group**

*SPO<sub>2</sub> Variable*

The comparison of the SPO2 variable of the PW Group with Mean± SD on Day 1 is 89.867±3.248, on Day 2 is 89.867 ± 3.248 and on Day 3 is 92.533±3.159. The F value is 3.431, and P-value is 0.0417, which is considered as significant.

Comparison on the basis of SPO2 variable of PW group on Day 1, Day 2 and Day 3.

*PEFR variable*

The comparison within the group PW on the basis of PEFR variable having Mean± SD on Day 1 is 268.00±62.887, on Day 2 is 291.87±68.547 and on Day 3 is 339.07±75.682. The F value is 4.093 and P-value is 0.0238, which is considered significant.

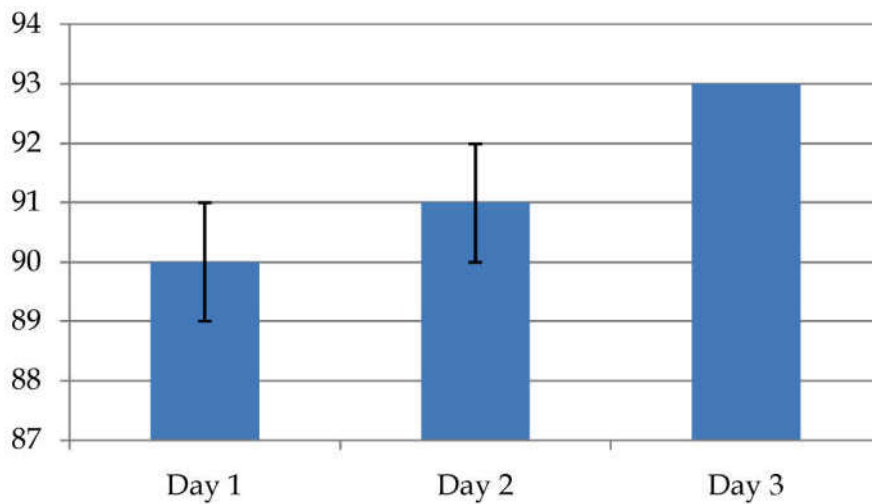


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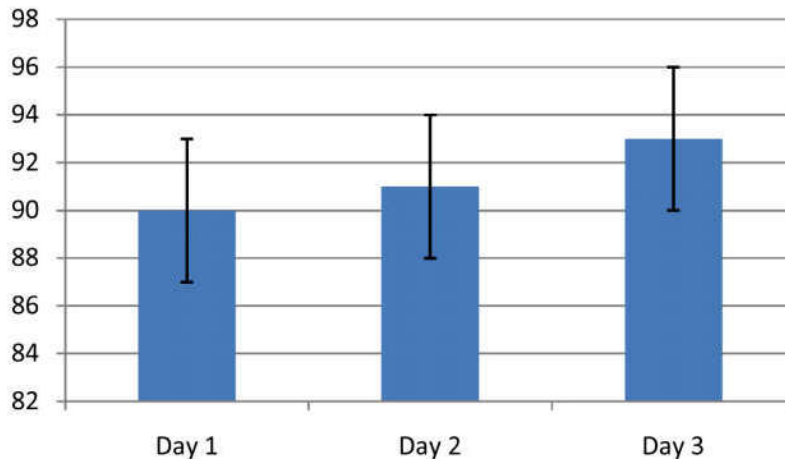


Fig. 5:

Comparison on the basis of PEFR variable of PW group on Day 1, Day 2 and Day 3.

is  $4.800 \pm 1.424$  and on Day 3 is  $3.033 \pm 1.077$ . The F value is 17.827 and P value is 0.0001, which is considered significant.

*BRPE Variable*

The comparison of BRPE variable of PW Group on Day 1 having Mean  $\pm$  SD is  $5.867 \pm 1.407$ , on Day 2

Comparison of BRPE variable of PW Group on Day 1, Day 2 and Day 3.

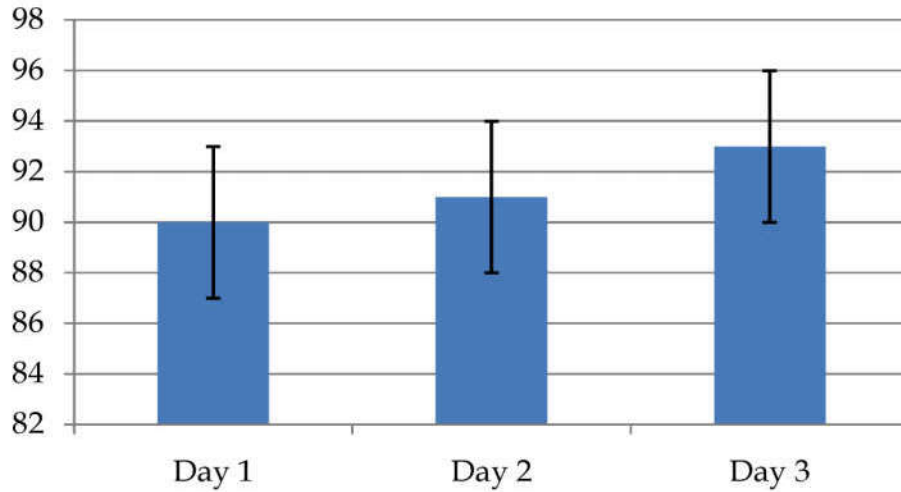


Fig. 6:

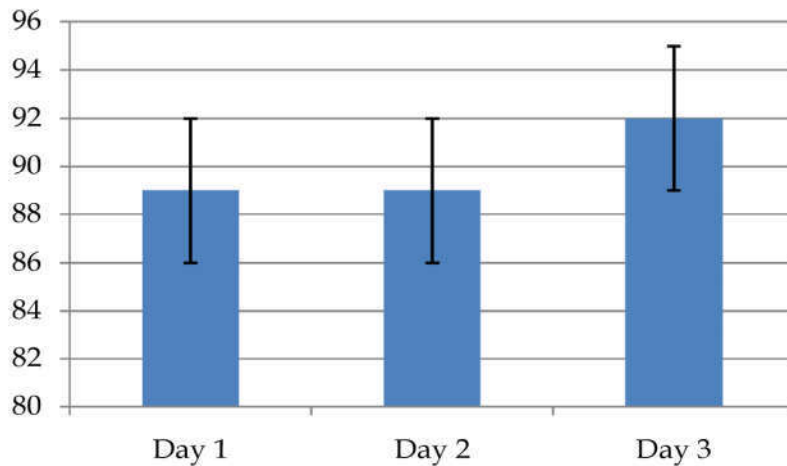


Fig. 7:

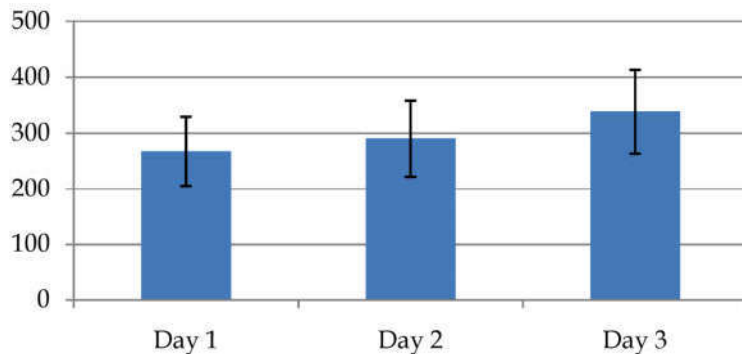


Fig. 8:

## Discussion

### *SPO2 Variable*

The result of our study shows a significant increase in SPO2 levels after ACBT, in COPD patients. Tjep and Jones et al. showed that there is improvement in SPO2 level after Breathing exercises rehabilitation [10,11]. Breathing exercises in COPD patients improves arterial gas levels significantly. M Vitacca et al, in 1998 showed that diaphragmatic Breathing improves arterial blood gases level [12].

In the variable of Heart Rate, there is significant decrease in Heart Rate from Day 1 to Day 3 in patients by ACBT. Jamal et al. in 2007 showed that there is gradual decrease in Heart rate after 30 minutes of treatment session with ACBT. Neil et al. in 2007 showed that there is increase in heart rate during exercise but it decreases after Breathing exercises [13].

Another finding of our study shows a significant increase in PEFr of the DRP Group after ACBT. Faling et al. in 1993 and Jamal et al. in 2007 showed the difference in lung function tests after pulmonary rehabilitation [14,15].

The next finding of our study shows that there is decrease in BRPE scale of the DRP group after ACBT. Gosselink et al in 1995 and Puhan et al. in 2009 showed that there is decrease in respiratory rate and decrease in dyspnea level of the COPD patients after controlled Breathing exercises. Pulmonary rehabilitation significantly reduced frequent hospitalizations and mortality rate and increased health-related quality of life [16,17].

### *PW Variable*

#### *SPO2*

Patterson JE et al. (2004) and Savci S et al. (2000) explained that ACBT proves to be increasing saturation levels in COPD patients [18,19].

#### *PEFR*

Savci S, et al in 2000, prove that ACBT is very effective technique in improving PEFr levels in COPD patients [20].

### *BHT Variable*

Breath hold increases the ventilation of the lungs by opening the collateral channels of ventilation. Miller et al in 1995 proved that ACBT improves ventilation of the lungs [21].

## Conclusion

The conclusion of our study is that ACBT in Dyspnea Reliving Position is very useful in the patients of COPD and it should be practiced to relieve dyspnea in dyspnea reliving positions. The capacity of the lungs also increased in the patients when trained with Breath hold, as it is very helpful in the opening of collateral channels of ventilation which also helps in patients taking the inhalers. ACBT also increased the lung volumes having a significant effect in lung volume. ACBT in dyspnea reliving positions increase the PEFr and also decrease the HR.

Paced Walk group have significant effect on Breath hold timing which improves SPO2 levels in blood. The PEFr also increase with the increase in controlled Breathing. It shows that controlled Breathing improves Breath hold timing and also the controlled Breathing increases the lung capacity of the COPD patients [22-27].

### *Limitations and Future of the Study*

This study was done on a small sample. This study can be done in large sample to measure the large difference. There can also be another control group for performing the 6MWT without any paced walk. The distance covered then can be measured and then compared with the distance of the Paced Walk group.

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