

An Evidence-Based Study: Effect of Physiotherapy Treatment on Exercise Capacity in Patients with COPD

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ABSTRACT

Background: Chronic obstructive pulmonary disease (COPD) is a respiratory disorder, associated with an ongoing limitation of airflow. COPD negatively having effects on patients' functional capacity.

Introduction: COPD having negative effects on patients' physical, occupational, and social functioning due to limited functional capacity and experience of frequent dyspnoea and fatigue during activities. To determine effective physiotherapy treatment on exercise capacity (6-MWT) in patients with COPD.

Design: The articles were searched in Google scholar, PubMed, Elsevier, Cochrane library by using keywords Chronic obstructive pulmonary disease (COPD), 6-Minute Walk Test (6-MWT). Articles which were done during the year 2012 - 2019 were only selected. Articles were selected only if they were Systematic review and meta-analysis, randomized controlled trial (RCT), includes subject with COPD, Exercise capacity (6-Minute Walk Test) were used as one of the outcome measure and physiotherapy intervention was given as a treatment.

Results: 80 to 85 articles were searched from different database out of them 10 articles were selected for the study, 5 systematic review and 5 RCTs. Data were extracted by one reviewer that includes the intervention description, inclusion/exclusion criteria, baseline data, values for all outcomes at baseline, post-intervention and follow-up.

Conclusion: Findings indicate that physiotherapy treatment, Inspiratory Muscle Techniques (IMT), Cycle Ergometer Training, Resistance Training, Manual Diaphragmatic Release Technique, Muscle Energy Techniques (MET), Yoga with Breathing Control, Diaphragmatic Breathing Training, Aerobic Exercise, Upper Limb Resistance Exercise and Breathing Exercises are effective to improve exercise capacity (6-MWT). Resistance Training, Muscle Energy Techniques, Aerobic Exercise, Yoga with Breathing Control- these are the techniques which having 1A level of evidence. So, these are highly recommended to improve exercise capacity in patient with COPD.

Keywords- COPD, 6-Minute Walk Test (6-MWT), Physiotherapy treatment, Inspiratory Muscle Training (IMT), Diaphragmatic Breathing Training

INTRODUCTION

Chronic obstructive pulmonary disease (COPD) is a respiratory disorder,

associated with an ongoing limitation of airflow, mainly to the expiratory airflow.

^[1,2] The cause of COPD is a chronic

inflammation in the lung and airways in response to poisonous particles and gases. During physical activity, COPD-associated limitation in the airflow is exacerbated and so dyspnoea prevents patients from continuing physical activity. [3] COPD having negative effects on patients' physical, occupational, and social functioning due to limited functional capacity and experience dyspnea and fatigue during daily activities. [4,5]

Physiotherapy has been used for reduced exercise capacity. Inspiratory Muscle Training (IMT), Cycle Ergometer Training (CET), pulmonary rehabilitation (PR), resistance training, manual diaphragmatic release technique, muscle energy technique (MET), Yoga, Aerobic Exercise, Diaphragmatic Breathing Technique, upper limb and breathing exercises- All are used for exercise capacity. Treatment Outcome are measured by 6-Minute Walk Test (6-MWT) at baseline and at end of the treatment phase and in some study, it measures at some specific interval.

Evidence based research is needed to determine effective therapeutic techniques to improve exercise capacity (6-MWT).

METHODOLOGY

Search strategy and study selection:

RESULTS

The articles were searched in Google scholar, PubMed, Elsevier, Cochrane library by using keywords Chronic obstructive pulmonary disease (COPD), 6-Minute Walk Test. Articles which were done during the year 2012 - 2019 were only selected.

Inclusion criteria for articles are:

- Systematic review and meta-analysis Or Randomized Control Trials (RCT).
- The articles that includes subjects with COPD.
- Use of physiotherapy intervention for treatment of reduced exercise capacity.
- 6- MWT as one of the outcome measures.

Articles were excluded if they were Correlational study or Case study, other than physiotherapy treatment as an intervention and reduced physical exercise due to COPD only.

Study Selection: 80 to 85 articles were searched from different database out of them 10articles were selected for the study.

Quality measurement:

Data were extracted by one reviewer that includes the intervention description, inclusion/exclusion criteria, baseline data, values for all outcomes at baseline, post-intervention and follow-up.

Author	Study Design	No. Of Subjects	Treatment	Intervention	Outcome measures	Results	Level of evidence
<u>Rugbjerg M Et Al., (2015)</u> ^[6]	A Systematic Review with Meta-Analysis	4 RCTs (489 Participants)	Pulmonary Rehabilitation	Aerobic exercise, Pursed lip breathing, other breathing exercises, cycling, walking session duration=30 to 90 minutes, frequency= twice/ thrice a week for 4 to 6 months.	Outcomes are Health-Related Quality of Life (HRQOL), maximal exercise capacity (6-MWT), muscle strength,	Significant improvement in 6-MWT but <i>clinically nonsignificant</i> improvement in 6-MWT ,	1A
Ning LiEt Al., (2019) ^[7]	A Systematic Review	11 RCTs (405 Participants)	Resistance Training	Leg press, knee extension, knee flexion, chest press, seated row, and shoulder press, hip abduction in standing, seated row, lunges etc. with different-different duration, repetition and frequency	Outcome measures are 6MWT , CWRET (constant work rate endurance test), 6PBRT(6-min pegboard and ring test) UULEX (unsupported upper limb exercise test), and CPET (cardiopulmonary exercise test)	Resistance training significantly improved 6-min walking distance 6-MWT	1A
<u>Paneroni M Et Al., (2017)</u> ^[8]	A Systematic Review and Meta-Analysis	10 RCT (n=458)	Aerobic Exercise Training	Aerobic Exercise Training (Leg exercises, cycling, free walking, treadmill walking included) duration from 4 to 52 weeks with 1 to 5 sessions per week lasting 15 to 40 minutes each.	Outcome measures are 6-minute walking test(6-MWT) and/or health-related quality of life assessed by the St. George's Respiratory Questionnaire (SGRQ).	Statistically significant improvement in 6-MWT	1A
<u>Baxter Da Et Al., (2019)</u> ^[9]	A Systematic Review	3 RCTs (90 Participants)	Muscle Energy Technique (MET)	1st RCT subjects receive MET + CPT (conventional chest physiotherapy) 2 nd RCT subjects receive MET 3 rd RCT subjects receive MET + exercise	Outcomes are Inspiratory Capacity, Forced Expiratory Volume in One Second (FEV1), And Forced Vital Capacity (FVC). Exercise Capacity Measured by Six-Minute Walk Test (6MWT), Quality of Life or Health Status.	2 studies assessed exercise capacity using the 6MWT individual study results showed that MET+CPT was superior to CPT alone. in the other study, MET + exercise therapy improved walking distance compared to sham-MET + exercise therapy	1A
Holger Cramer Et Al., (2019) ^[10]	A Systematic Review and Meta-Analysis	11 RCTs (586 Participants)	Yoga	Hatha yoga, Pranayama, laughter yoga, Kripalu yoga, Iyengar yoga etc. with conventional drug or physiotherapy as co-intervention Duration= 2 weeks to 9 months, Frequency= once/ twice daily or twice weekly, Session duration= 10-90 Minute	quality of life, dyspnea, exercise capacity(6-MWT), and pulmonary function (FEV1),	Effects of yoga with breathing on exercise capacity (6-MWT), but yoga posture was not significantly affecting the 6-MWT	1A
<u>Wellington P. Yamaguti et al., (2012)</u> ^[11]	RCT	Total = 30 Treatment group= (n=15) Control group= (n=15)	Diaphragmatic breathing training program	Training group completed a 4-week supervised DBTP (3 individualized weekly sessions), while control group (CG) received their usual care.	Outcome assessed by amplitude of the rib cage to abdominal motion ratio (RC/ABD ratio) and diaphragmatic mobility, 6-minute walk test (6-MWT)and health related quality of life	6-MWT distance improved in treatment group.	1B
<u>Rocha T Et Al., (2015)</u>	RCT	Total= 20	Manual Diaphragmatic	The experimental group received six treatments with the manual diaphragm	Outcome are diaphragmatic mobility, the 6-minute walk test(6-	Manual Diaphragmatic Release Technique significantly improved the 6-minute walk	1B

[12]		Treatment Group (n=11) Control Group (n=9)	Release Technique	release technique on non-consecutive days within a 2-week period. The control group received sham treatments following the same regimen.	MWT), maximal respiratory pressures; and abdominal and chest wall kinematics. Outcomes were measured before and after the first and sixth treatments.	(6-MWT) distance over the treatment course	
Wang Ket al. (2017) [13]	RCT	Total=81 CET+IMT Group (n=28) CET Group (n=27) Free Walking (n=26) Control Group	Cycle Ergometer training (CET) and Inspiratory Muscle Training (IMT)	Combined training group received 30-minute CET and 14-minute IMT three times per week for 8 weeks, IMT was given with a threshold-loaded IMT device CET group received 30-minute CET three times per week for 8 weeks, CET was performed on an electromechanically braked cycle	Respiratory muscle strength, exercise capacity(6MWT), pulmonary function, dyspnea, quality of life, emotional status, nutritional status, and body mass index, airflow obstruction, and exercise capacity index were measured before and after the pulmonary rehabilitation program.	Exercise capacity (6-MWT) was significantly improved in group CET+IMT and CET group	1B
Yekefallah L Et Al., (2019) [14]	RCT	Total= 75 Group 1 (n= 25) Group 2 (n= 25) Group 3 (n= 25)	Upper Limb Exercise (Strengthening Exercises) And Breathing Exercises (Pursed-Lip and Diaphragmatic Breathing).	First group were performing upper limb exercises thrice weekly for one month, second group were doing pursed-lip and diaphragmatic breathing exercises four times daily for one month at their homes. however, the patients in the control group received no exercise intervention.	Six-minute walk test(6-MWT) was performed by each participant	Walking distance in the control group didn't change significantly, while it remarkably increased in both the upper limb exercise and the breathing exercise groups. Walking distance in the upper limb exercise group was significantly greater than the breathing exercise group and the control group however, the difference between the breathing exercise and the control groups was not statistically significant	1B
Bavarsad Mb Et Al., (2015) [15]	RCT (Single-Blind)	Total=40 Treatment Group (n=20) Control Group (n=20)	Inspiratory Muscle Training (IMT)	Treatment group received IMT with flow volumetric respiratory exerciser named (respivol), for 8 weeks (15 min/day for 6 days/week)	Each patient was assessed before and after 8 weeks of training for exercise capacity by 6-min walking test (6MWT)	Statistically significant increase in 6-MWT	1B

CONCLUSION

According to these articles Inspiratory Muscle Techniques (IMT), Cycle Ergometer Training, Resistance Training, Manual Diaphragmatic Release Technique, Muscle Energy Techniques, Yoga with Breathing Control, Diaphragmatic Breathing Training, Aerobic Exercise, Upper Limb Resistance Exercise and Breathing Exercise – These physiotherapy treatments are effective to improve exercise capacity. (6-MWT)

Resistance Training, Muscle Energy Techniques, Aerobic Exercise, Yoga with Breathing Control- these are the techniques which having 1A level of evidence. So, highly recommended to improve exercise capacity in patient with COPD.

Pulmonary rehabilitation (Aerobic exercise, Pursed lip breathing, other breathing exercises, cycling, walking) clinically not shows any significant difference and only Yoga posture was not improving 6-MWT.

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