Scholarly Research Journal for Humanity Science & English Language,
Online ISSN 2348-3083, SJ IMPACT FACTOR 2026: 8.739,
https://www.srjis.com/issues_data/291
PEER REVIEWED, REFEREED & INDEXED JOURNAL, APRIL-MAY 2026, VOL-14/75

TO EVALUATE THE EFFECT OF RESPIRATORY MUSCLE TRAINING IN COPD PATIENTS

Dr. Shaan Shahid (PT)

Assistant Professor, T.S. Mishra University, Lucknow.

Paper Received On: 21 APRIL 2026

Peer Reviewed On: 25 MAY 2026

Published On: 01 JUNE 2026

Abstract

BACKGROUND AND OBJECTIVES:
To find out the effect of Respiratory muscle training (RMT) in COPD patients using threshold devices and breathing exercises and its respective effect on quality of life (QOL).
MATERIAL AND METHOD:
Overall 40 individuals were enrolled in this study on the basis of their IPAQ score which implies physically inactivity in the selected group of participants. They were partitioned into group of two, group A and group b, who performed RMT with threshold device and RMT with breathing exercises respectively. Cardiopulmonary pulmonary parameters were evaluated both pre-intervention and post-intervention which includes HR, RR, BP (SBP & DBP) by digital sphygmomanometer, SpO_2 (using pulse oximeter) and level of dyspnea was measured and also ABC score pre and post intervention was recorded to check the effectiveness on quality of life.
RESULT:
A dedicated chapter for results has been discussed further in the study showing a significant change in variables specifically heart rate (HR), blood pressure (SBP & DBP), oxygen saturation (Sp_{O2}), respiratory rate (RR), rating of perceived exertion (RPE), and assessment of burden of COPD (ABC) score which has a direct relation with the quality of life (QOL) of the participant in each group.
CONCLUSION:
The research establishes that RMT with the help of Threshold devices shows a better effect in QOL of COPD patients as compared to RMT with just simple breathing exercises.

INTRODUCTION

Targeted exercise-induced overload facilitates physiological adaptation of the respiratory musculature in stable COPD, resulting in superior functional capacity and clinical gains. The research is based on the effect of respiratory muscle training in regards to the use of respiratory muscle training (RMT) methods in COPD patients.

Physiological changes in pulmonary function with aging include decreased lung elasticity, diminished strength of respiratory muscles, and reduced compliance of the chest wall. Sarcopenia refers to the age-associated decline in skeletal muscle mass, strength, and overall physical performance. Additionally, respiratory muscle strength declines in older adults with sarcopenia. These physiological alterations make it challenging for elderly individuals to sustain physical activity, which is vital for a healthy lifestyle. Reduced strength of respiratory muscles may contribute to a higher risk of illness and disability in this population. Consequently, various exercise interventions have been suggested to enhance physical performance in older adults. Respiratory muscle training (RMT) has demonstrated several clinical benefits, including improved diaphragm strength, enhanced aerobic capacity, and better cough efficiency in elderly individuals. It has also been shown to improve physical performance, particularly in less-fit populations such as older adults. However, poor adherence to pulmonary rehabilitation programs, including RMT, continues to be a significant challenge.

In general, three forms of respiratory muscle training (RMT) have been identified: resistive training, pressure-threshold loading, and normocapnic hyperpnea so far in the existing researches. Exercise frequency, duration, and intensity need to be appropriately planned to achieve an effective training outcome. On the other hand, in the abundance of existing data related to inspiratory muscle training (IMT), however, there is still a scarcity of clinical and physiological research focusing on expiratory muscle training (EMT). Notably, although inspiratory muscle training (IMT) appears to offer slightly greater benefits beyond respiratory muscle function such as reducing dyspnea the effectiveness and safety of expiratory muscle training (EMT) in patients with COPD have yet to be fully established.

This research is based on an overall rehabilitation protocol in COPD patients with help of a device namely HS730-010 Threshold IMT (730) and also an IMT + EMT combined device known as Breather for one set of group and only simple breathing exercises for the other group and it overall effect on the QOL of the patients in each group post the experimental study.

Threshold IMT is a device used for inspiratory muscle training that aids in strengthening the respiratory muscles. It delivers a constant and targeted pressure to train inspiratory muscle strength and endurance, independent of the patient's breathing speed.

It can be used in any position, ensuring effective therapy. The device delivers consistent pressure, eliminating the need for a pressure indicator. In addition to improving breathing, it also enhances muscle strength.

Respiratory muscle dysfunction is influenced by several factors associated with the presence and severity of COPD. Both intrinsic factors (such as muscle mass and metabolic changes) and extrinsic factors (including alterations in chest wall geometry, diaphragm positioning, and systemic metabolic conditions) can impair respiratory muscle function.

Although RMT contributes to intrathoracic decompression, it is associated with minimal side effects. Moreover, patients with heart failure do not show any worsening of cardiac output during training. Therefore, apart from cases such as unstable asthma, reduced perception of dyspnea, a history of spontaneous pneumothorax, or the presence of emphysematous bullae near the pleura, there are generally no contraindications to IMT.

Therefore, the aim of this study is to assess the effect of respiratory muscle training on cardiorespiratory fitness and overall quality of life in COPD patients by following the protocol of RMT with threshold devices and RMT with breathing exercises respectively.

Objective of study:

- To evaluate the effect of respiratory muscle training in COPD patients.
- To investigate the effects of threshold inspiratory muscle training in patients in chronic obstructive pulmonary disease using HS730-010 Threshold IMT (730) device and IMT + EMT combined breather.
- To evaluate the impact of using threshold devices in COPD patients on dyspnea, quality of life, exercise capacity, and inspiratory muscle strength.

Hypothesis:

- Experimental hypothesis:
  There will be a significant effect of respiratory muscle training in COPD patients.
- Null hypothesis: -
  There will be non- significant effect of respiratory muscle training in COPD patients.

METHOD- Sample size:- Total 40 participants were chosen for the study based on inclusion & exclusion criteria.

Space & Location:-The sample of convenience was taken from respective Cardiopulmonary based hospitals, Lucknow.

Study Design:- It was a rehabilitation based experimental study.

Inclusion Criteria:

Age – 40 years and above

Gender – Both male and female

COPD stage 1,2 and 3 as per gold criteria flow limitation.

Not participated in pulmonary rehabilitation or any aerobic training.

Participants should be willing to participate in the study.

Exclusion Criteria:

- Musculoskeletal defects
- Neurological defects
- No previous history of unstable cardiorespiratory disease.
- Unable to perform the experiment.
- Factors which may affect the efficacy of the test.

Variable

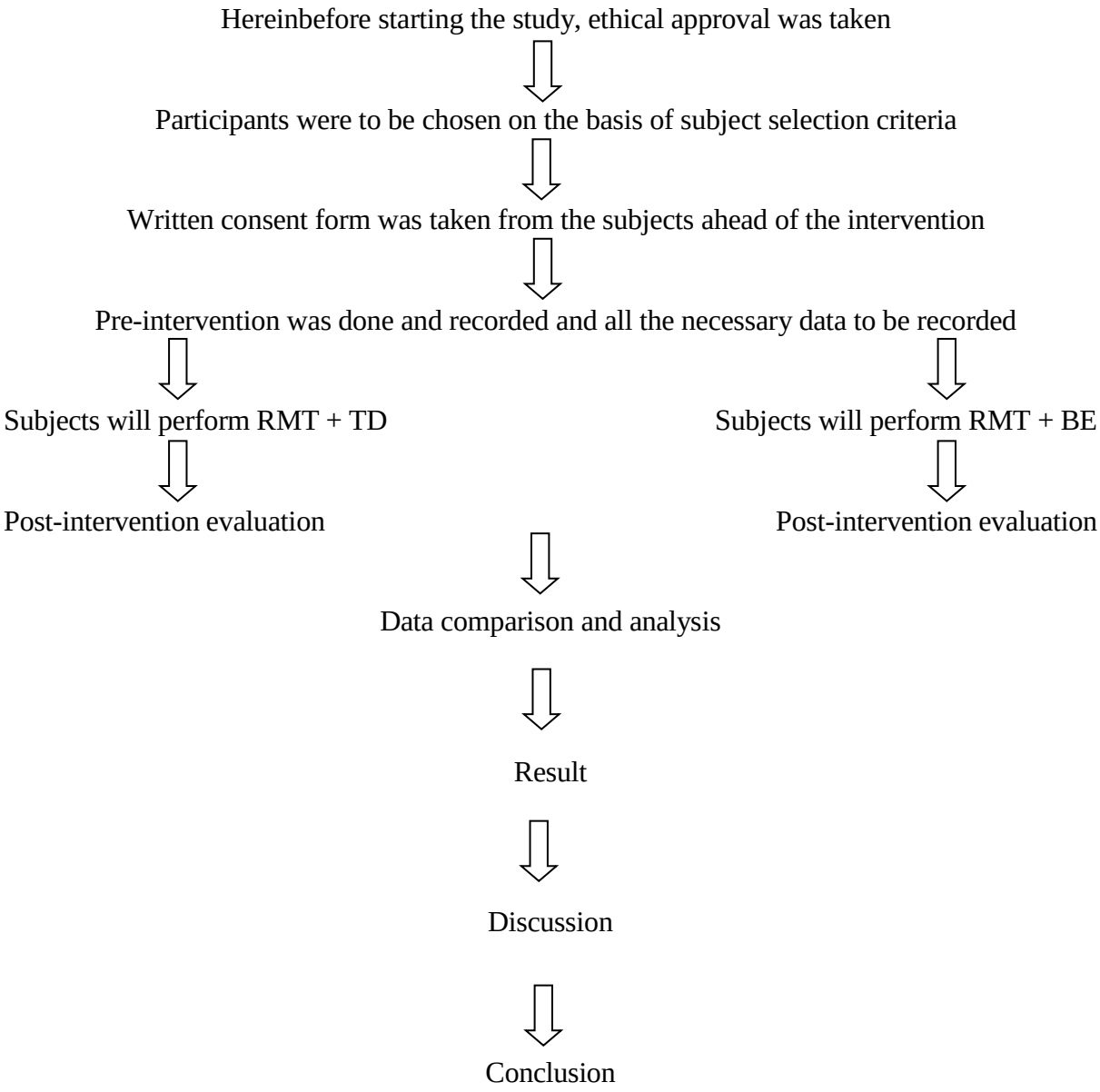
Independent Variable:

- Respiratory Muscle Training
- COPD Patients

Dependent Variable:

- ABC Score Scale
- Heart Rate (HR)
- Respiratory Rate (RR)
- Blood Pressure (BP) SBP & DBP
- Oxygen saturation of blood (SpO_2)
- Modified Borg Rating of Perceived Exertion

Protocol:



RESULT-

This chapter deals in the data analysis of two groups, group A, and group B, both groups consist of COPD patients and to record its effect on outcome measures HR, RR, BP (SBP AND DBP), SpO_2, rate of perceived exertion (RPE) and ABC score after performing RMT with threshold device and RMT with breathing exercises.

Demographic data:

Table 1 Distribution of gender of the study subject in different groups

Gender	Total	RMT + TD Group A	RMT + BE Group B
Male	20	10	10
Female	20	10	10

Table No.2: Mean age of subject in different groups

Test	Mean	SD
Group A RMT + TD	48	3.6
GROUP B RMT + BE	50	5.7

Table No. 2 shows the mean age of study subject in different groups. The mean age in different groups is significantly different. Group A includes less aged while group B has more aged subjects.

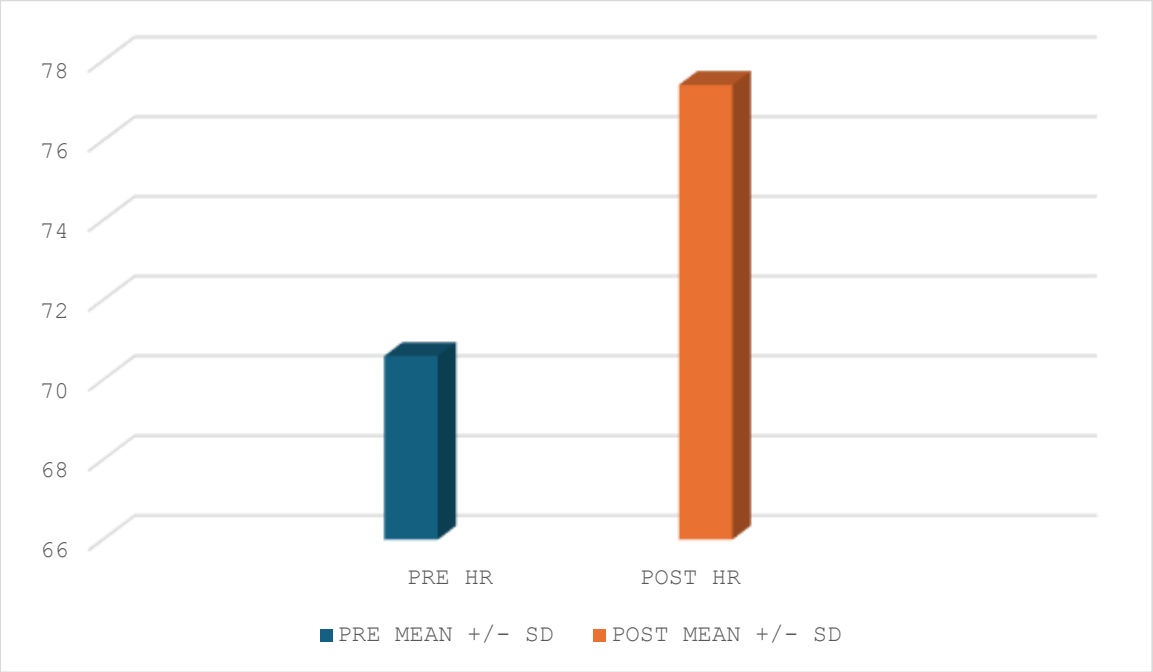
Effect of Respiratory Muscle Training in COPD patients using Threshold devices

Table No. 3: shows the mean value of pre-intervention and post-intervention in RMT + TD Group A

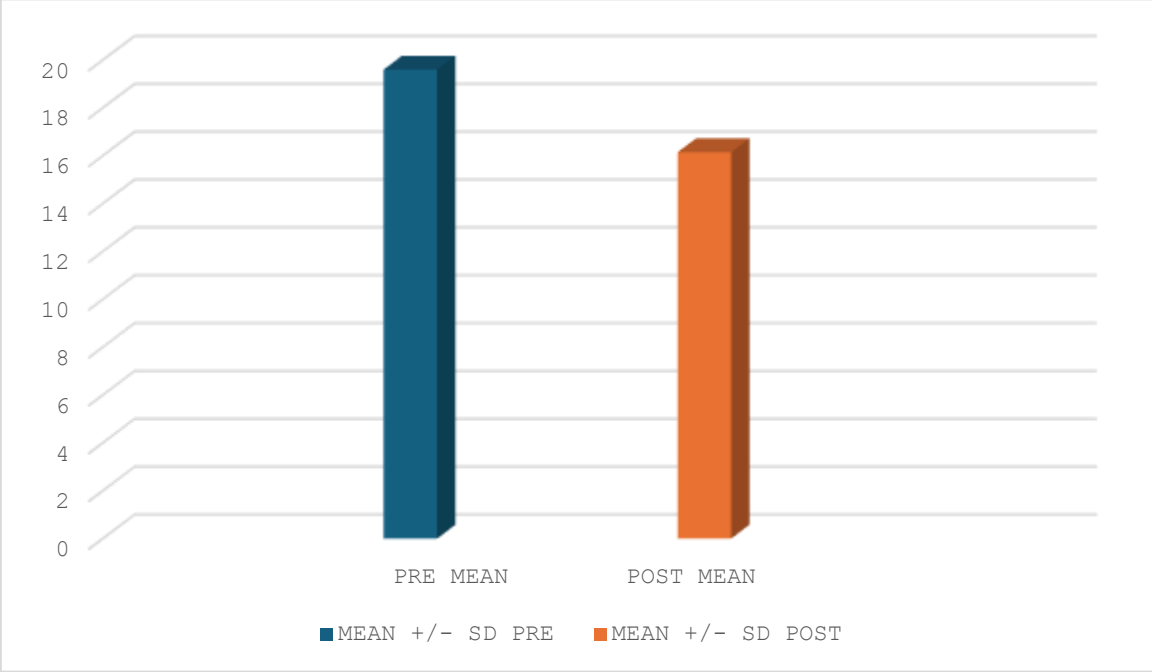
RMT + TD Group A

VARIABLES	PRE-INTERVENTION MEAN	PRE-INTERVENTION ± SD	POST-INTERVENTION MEAN	POST-INTERVENTION ± SD	t score	p value
HR	70.6	3.02	77.4	2.2	2.093	0.05
RR	19.6	1.2	16.15	1.15	2.093	0.05
SBP	130.45	3.84	123.1	2.11	2.093	0.05
DBP	75.9	7.1	81.65	1.73	2.093	0.05
SpO_2	89.5	1.74	90.55	1.56	2.093	0.05
RPE	4.05	0.97	1.35	1.06	2.093	0.05
ABC Score	35.8	6.2	18	4.04	2.093	0.05

Table No. 3: reveals the mean value of pre-intervention and post-intervention variables (HR, RR, SBP, DBP, SpO_2, RPE, ABC Score), showing significant changes in each variable (t = 2.093, p = 0.05)



GRAPH No. 1: MEAN HR pre and post RMT + TD Group A



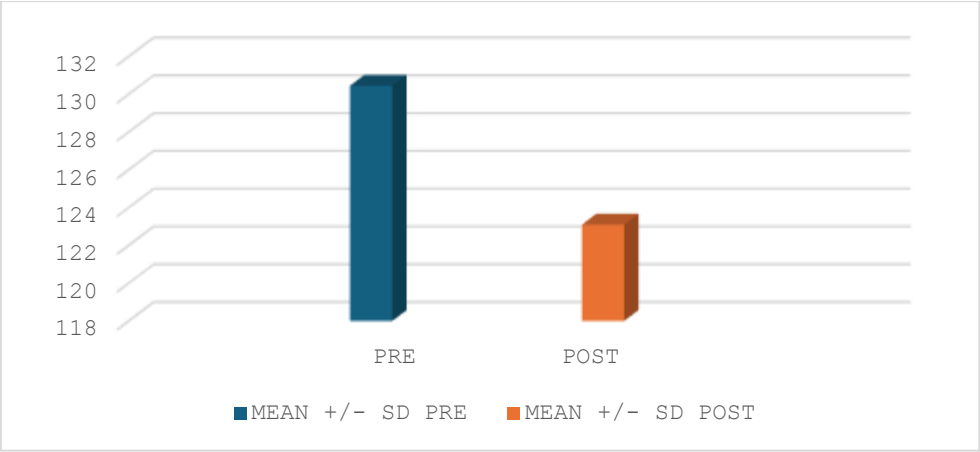
GRAPH No. 2: mean RR pre and post RMT + TD

Systolic Blood PRESSURE:

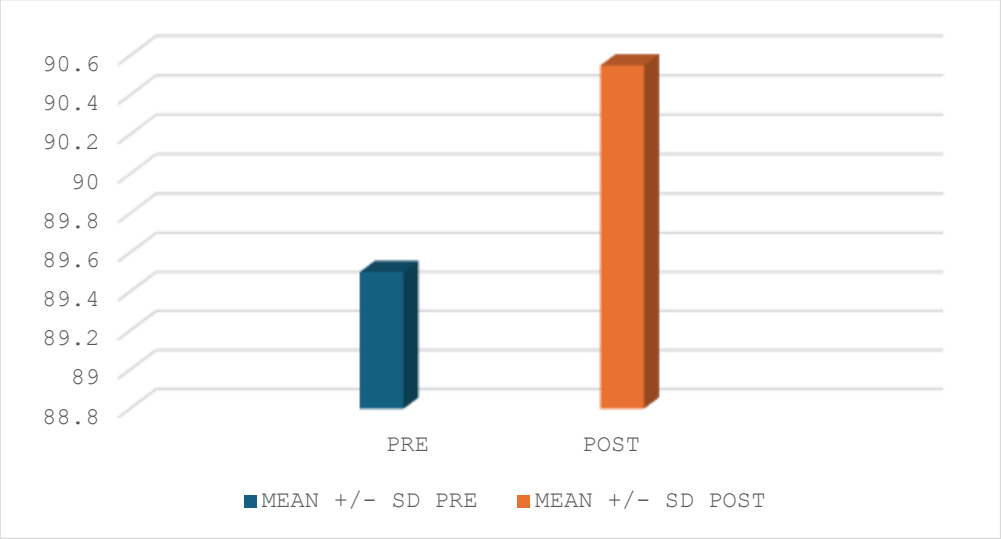
Table No. 4: Mean SBP pre and post RMT + TD

	PRE MEAN ± SD	**POST MEAN ± SD**	**t value**	**p value**
SBP	130.45	123.1	2.093	0.05

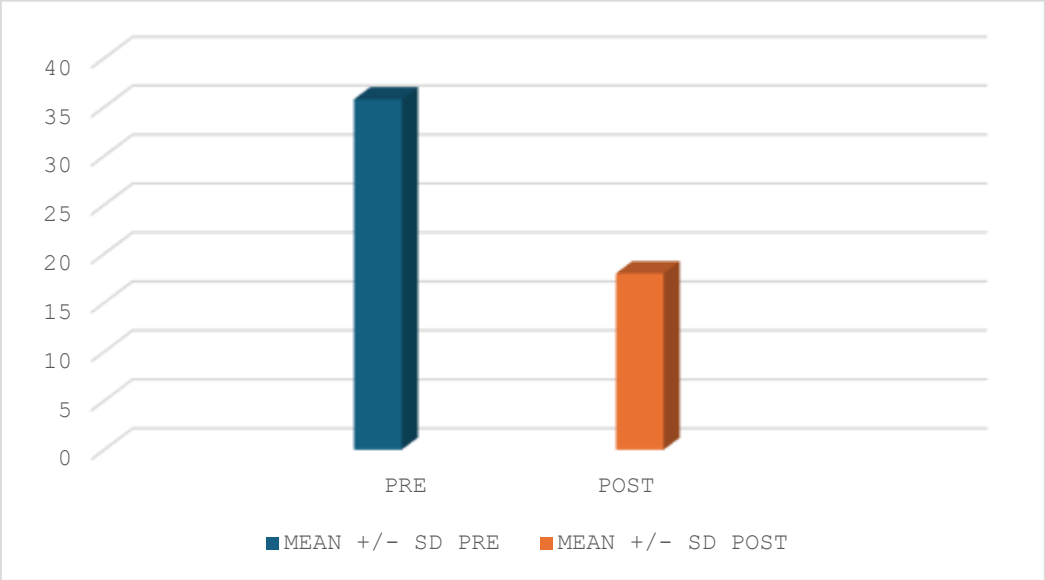
Table No. 4: shows the mean pre and post-test systolic blood pressure (SBP) of study subject in group A showing significant difference in mean value.



GRAPH No. 3: mean SBP pre and post RMT + TD



GRAPH No. 4: Mean SpO_2 pre and post RMT + TD



GRAPH No. 5: Mean ABC Score pre and post RMT + TD

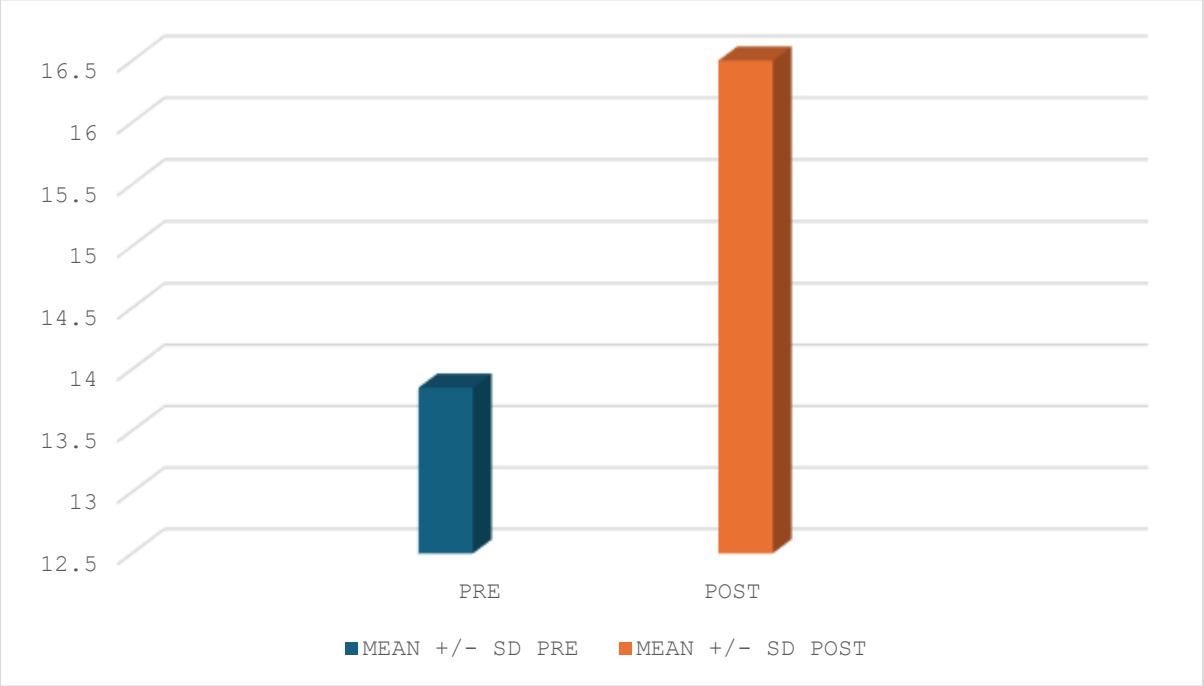
Effect of Respiratory Muscle Training in COPD patients performing Breathing Exercises

Table No. 4 shows the mean value of pre-intervention and post-intervention in RMT + BE Group B

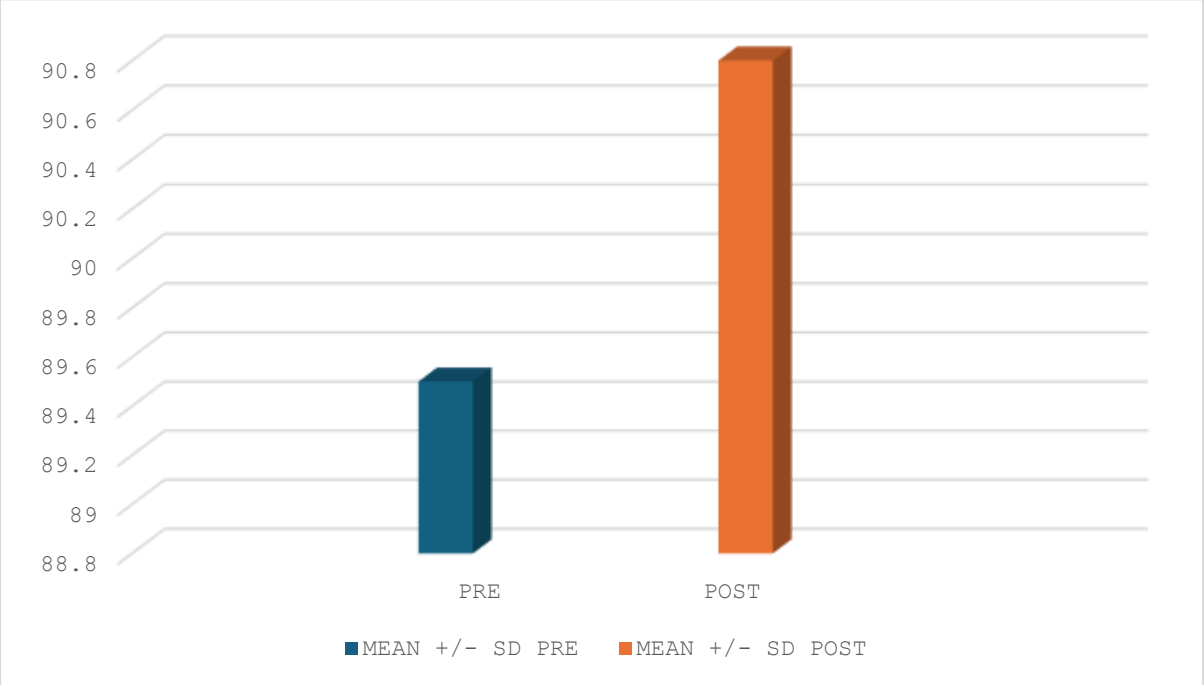
RMT + BE Group B:

VARIABLES	**PRE-INTERVENTION MEAN**	**PRE-INTERVENTION ± SD**	**POST-INTERVENTION MEAN**	**POST-INTERVENTION ± SD**	**t score**	**p value**
HR	68.35	2.35	77.75	2.84	2.093	0.05
RR	13.85	2.15	16.5	1.59	2.093	0.05
SBP	125.55	.35	122	2.98	2.093	0.05
DBP	78.1	7.26	81.15	4.05	2.093	0.05
SpO_2	89.5	1.2	90.8	1.56	2.093	0.05
RPE	4.75	1.57	3.05	0.73	2.093	0.05
ABC Score	50.1	3.34	40.25	3.29	2.093	0.05

Table No. 4 reveals the mean value of pre-intervention and post-intervention variables (HR, RR, SBP, DBP, SpO_2, RPE, ABC Score), showing significant changes in each variable (t = 2.093, p = 0.05)



GRAPH No. 6: mean RR pre and post RMT + BE



GRAPH No. 7: mean SpO_2 pre and post RMT + BE

DISCUSSION

The aim for the study was to evaluate the effect of respiratory muscle training in COPD patients in threshold devices and in breathing exercises respectively. According to the data collected from ABC scale RMT questionnaire shows that there is tremendous impact of RMT using threshold devices in individuals with COPD and their QOL.

In the present study the participants of Group A performed RMT in threshold devices whereas in group B the participants performed RMT in breathing exercises. Both groups had equal number of participants (n=20 in group A, and n=20 in group B)

In the present study outcome measure are taken in the form of HR, RR, SBP, DBP, SpO_2, RPE and ABC Scale score to assess the level of effect of RMT on cardiopulmonary fitness and QOL in COPD patients whereas taking a deep look into each variable specifically, firstly comes the prime most outcome measure of the entire study the ABC Scale score which demonstrated a great a change in both patient groups that is group A and B respectively.

In Group A there is a statistically significant increase in heart rate post-intervention. This increase indicates a higher cardiovascular demand or possibly increased sympathetic activity. In Group B there is a statistically significant increase in heart rate post-intervention. This suggests an elevated cardiovascular response post-intervention, potentially due to increased physical activity or improved cardiovascular fitness. Secondly, In Group A there is a statistically significant reduction in respiratory rate post-intervention. A lower respiratory rate suggests improved efficiency in breathing or relaxation of the respiratory muscles. The RR in group A showed a drop from mean RR and in group B a raise from mean RR, thus showing no signs of exacerbation and a controlled RR could be seen in both the groups post training sessions. In Group B there is a statistically significant increase in respiratory rate post-intervention. This increase indicates a higher respiratory demand or a shift in breathing pattern due to the intervention.

Thirdly, the SBP in group A showed a decrease from mean SBP and in group B also a decrease could be seen. In Group A there is a statistically significant reduction in systolic blood pressure after the intervention. This reduction signifies improved cardiovascular health or decreased cardiac workload. In Group B there is a statistically significant reduction in systolic blood pressure post-intervention. This reduction indicates improved vascular function or reduced arterial stiffness. In Group A there is a statistically significant increase in diastolic blood pressure after the intervention. This elevation warns further investigation, as it indicates

increased peripheral vascular resistance or other cardiovascular changes. In Group B there is a statistically significant increase in diastolic blood pressure post-intervention. The increase in DBP reflects changes in peripheral vascular resistance or cardiovascular adaptations due to the intervention. The DBP in group A showed an increase in DBP and in group B also an increase could be seen but it was overall controlled. Thus over all the blood pressure was maintained and controlled pre and post training sessions. Fourthly, In Group A there is a statistically significant increase in oxygen saturation post-intervention. This improvement suggests better oxygenation, which is crucial for overall physiological function. The SpO_2 in group A showed an increase in the oxygen saturation from mean SpO_2 and in group B a same result could be seen. So oxygen saturation showed a positive result by heading towards the optimal required $Sp_{O2.}$ There is a statistically significant increase in oxygen saturation post-intervention in Group B. Improved SpO2 indicates better oxygenation, which is beneficial for COPD patients as it enhances overall oxygen delivery to tissues.

Lastly, the RPE in both the groups showed a drop from severe breathlessness to moderate, very slight breathlessness and even no breathlessness in group A and B respectively. In Group A there is a statistically significant reduction in perceived exertion post-intervention. Participants reported feeling less exerted, indicating that the intervention have made the exercise feel easier or less strenuous. There is a statistically significant decrease in perceived exertion post-intervention in Group B. A lower RPE suggests that participants found the exercises less strenuous after the intervention, indicating improved exercise tolerance or efficiency. To be specific in group A showed a change from severe breathlessness to no breathless at all and in group B a significant change from severe breathless to moderate and in few participants to no breathlessness at all depending on level of training and dedication of the participants. Concluding in this scenario of RPE Group A wherein Threshold devices were used as a training protocol showed better results post training as compared to group B.

CONCLUSION

The present study shows that RMT with the help of Threshold devices shows a better effect in QOL of COPD patients as compared to RMT with just simple breathing exercises.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE- This manuscript reporting study involving human participants with their consent.

DATA AVAILABILITY- The data presented in this study are available on request from the corresponding author.

ACKNOWLEDGEMENT -the author would like to thank all participants for cooperating in data collection.

CONFLICT OF INTEREST- The author declares that there is no conflict of interest regarding the publication of this paper.

FUNDING STATEMENT- This research received no external funding.

AUTHORS CONTRIBUTION-

1. Dr. Shaan Shahid (PT) conducted research work, drafted the manuscript.

REFERENCES

Ernesto Crisafulli, Stefania Costi, Leonardo M Fabbri, and Enrico M Clini (2007) Respiratory muscles training in COPD patients

E Gedde, Kelly O'Brien, W Darlene Reid, Dina Brooks, Jean Crowe (2008) Inspiratory muscle training in adults in chronic obstructive pulmonary disease: an update of a systematic review.

Peter M Lalley (2013) The aging respiratory system--pulmonary structure, function and neural control.

Helga, Brandão, Guilherme, Shirley Campos, Andrea, Armele Dornelas (2014) Effects of inspiratory muscle training in elderly women on respiratory muscle strength, diaphragm thickness and mobility.

Marinella Beckerman, Rasmi, Margalit Weiner, Paltiel Weiner (2005) The effects of 1 year of specific inspiratory muscle training in patients in COPD.

M K Covey, J L Larson, S E Wirtz, J K Berry, N J Pogue, C G Alex, M Patel (2001) High-intensity inspiratory muscle training in patients in chronic obstructive pulmonary disease and severely reduced function.

R Gosselink, R C Wagenaar, M Decramer (1996) Reliability of a commercially available threshold loading device in healthy subjects and in patients in chronic obstructive pulmonary disease.

Christine Borge, Kåre Birger Hagen, Anne, Ernst, Torbjørn Moum, and Astrid Wahl (2014) Effects of controlled breathing exercises and respiratory muscle training in people in chronic obstructive pulmonary disease: results from evaluating the quality of evidence in systematic reviews.

Lalley PM. The aging respiratory system--pulmonary structure, function and neural control.

Souza H, Rocha T, Pessoa M.C, Brandao D, Effects of inspiratory muscle training in elderly women on respiratory muscle strength, diaphragm thickness and mobility.

Illi SK, Held U, Frank I, Spengler CM. Effect of respiratory muscle training on exercise performance in healthy individuals.

Gosselink R, Janssens W, Decramer MJ. Exercise training and pulmonary rehabilitation: new insights and remaining challenges.

Holland AE, Cox NS, Houchen-L, Rochester CL, Garvey defining modern pulmonary rehabilitation.

Mar PL, Black BK, Diedrich A, Paranjape SY Valsalva maneuver in pulmonary arterial hypertension: susceptibility to syncope and autonomic dysfunction.

Evans JA, Whitelaw WA. The assessment of maximal respiratory mouth pressures in adults.

Miller A. Lung function testing: selection of reference values and interpretative strategies.

Nici L, Donner C, Wouters E, Ambrosino N, Bourbeau J, et al. American Thoracic Society/European Respiratory Society statement on pulmonary rehabilitation.

Buckley JP, Sim J, Eston RG, Hession R, Fox R. Reliability and validity of measures taken during the Chester step test to predict aerobic power and to prescribe aerobic exercise.

Criswell E. Cram's introduction to surface electromyography. Jones & Bartlett Publishers. 2010.

Beaumont M Effects of inspiratory muscle training in COPD patients: a systematic review and meta-analysis.

Gholami BB. Inspiratory muscle training in rehabilitation of low back pain: a randomized controlled trial.

COPD: Journal of Chronic Obstructive Pulmonary Disease Assessment of Burden of COPD (ABC) Scale: AReliable and Valid Questionnaire by Thomas C. H. Bemelmans, Daniel Kotz, Thys van der Molen, Johannes C. C. M. in 't Veen, Niels H. Chavannes.

https://doi.org/10.3109/15412555.2015.1118025