RESEARCH PAPER

Respiratory Muscle Stretch Gymnastic with Diaphragmatic Breathing On Dyspnea and Exercise Capacity in Older Adults: A Comparative Study

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ABSTRACT

Introduction: All the systems of the body show deleterious changes due to age with respiratory system acting as no exception. Studies show that dyspnea in elderly population accounts for 17% to25% and reduced exercise capacity for 30% in persons above 65 years of age. There is a dearth of researches to compare whether combining Respiratory muscle stretch gymnastic with diaphragmatic exercise shows any additional benefit in reducing dyspnea and increasing exercise capacity on relatively healthy geriatric population.

Aim: To compare the effect of Respiratory muscle stretch gymnastic with diaphragmatic exercise over diaphragmatic breathing exercise in reducing dyspnea and increasing the exercise capacity in geriatric population.

Materials and Methods: This pre and post experimental design is conducted in Guwahati, Assam for a duration of 4 weeks. 84 elderly persons whose showed mMRC scale ≥ 2 was taken. The patients were divided into two groups using systemic random sampling procedure. Respiratory muscle stretch gymnastic with diaphragmatic breathing exercise was given in one group and diaphragmatic exercise alone was given in another. The treatment was given for 4 weeks, 6 days a week and 3 times daily. 2 minutes' walk test and mMRC scale was used as outcome measures. The results was analysed using Statistical Package for Social Sciences (SPSS) software version 25.0.

Conclusion: Both the groups were effective in reducing dyspnea and increasing exercise capacity. However between the two groups, the group that received combination of Respiratory muscle stretch gymnastic with diaphragmatic exercise showed more significant improvement.

Keywords: Exercise capacity, Dyspnea, Geriatric, Respiratory muscle stretch gymnastic, Diaphragmatic exercise.

How to cite this article: Bhattacharya U, Gogoi P, Bhattacharya U, Respiratory Muscle Stretch Gymnastic with Diaphragmatic Breathing On Dyspnea and Exercise Capacity in Older Adults: A Comparative Study. Int J Drug Deliv Technol. 2026;16(10s): 794-798; DOI: 10.25258/ijddt.16.10s.94.

Source of support: Nil

Conflict of interest: None

INTRODUCTION

National policy for older person 1999 categorises person's above 60 years as geriatrics.[1] The Indian elderly population over the last 10 years seems to be increasing in accordance to Indian national census 2011.[2] An estimate of 8.6% of people are above 60 years of age in India. Such a huge number of populations require the attention of health professionals as the anatomical and physiological ability of the body decrease with age. This reduces the quality of life of the population leading to even disturbance in the mental wellbeing such as depression.

As age increases there is decrease in the lung volume, muscle function, reduced capacity for mucus clearance. Age also takes a toll on the immunity making them susceptible for infection.[3] Physical activity helps to maintain the potency of geriatric individual so that they stays active till the last day of their life. Studies shows that lung function and the aerobic capacity decreases by 40% between the age of 25 to 80 years.[4] As per World health organisation 150 to 300 minutes of aerobic exercise is required per week but elderly individuals are hardly seen engaging in physical activity due to reduced energy level, comorbidities, weakness, pain and psychological factors. Easier and fun full activities can be adopted by the geriatric population so that they are interested to carry out the movements so that dyspnea and exercise capacity can be addressed.

Respiratory muscle stretch gymnastic is an inexpensive non pharmacological intervention for reducing dyspnea and increasing exercise capacity. Respiratory muscle stretch gymnastic (RMSG) uses stretching and breathing

exercises together. This technique stretches internal intercostal muscle during exhalation and external intercostal muscle during the inhalation process.[5] Studies shows that there is change in the lung function and reduction in dyspnea following the administration of RMSG exercises in COPD and CABG patients.[6,7,8]

Diaphragmatic breathing is a slow and deep breathing method through the nose by using the diaphragm with minimal use of chest.[9] The exact mechanism for reducing dyspnea following diaphragmatic breathing exercise is not known but hypothesis suggest that decrease minute ventilation, slowing inspiratory flow rate, improving ventilation-perfusion, decreasing the work of breathing may be the reasons.[10]

MATERIAL AND METHODS

This study was carried in old age homes in Guwahati from April to September, 2025. It is a pre and post experiment carried out where initially a total of 118 candidates were selected, among which 84 candidates meeting with the inclusion criteria were considered. Prior to enrolment of the candidates, clear description of the procedure was given and informed consent was signed. In the study, pre and post outcome assessments of the candidates were conducted by trained physiotherapist as per the study procedures and methods. Participants were randomly assigned to Group A and Group B using random number sequence developed by computer.

Outcome measures used were 2 min walk test and mMRC scale to measure the exercise capacity and dyspnea.

The sample size was predicted using hypothesis tests by Cohen's d and power, with Cohen's d at 0.5 and power 0.9.[Kish 1965] The derived sample size was 42.5 patients (rounded to 42) per group.

Inclusion criteria: Candidates from all gender were included considering their age of 60 years and above with mMRC scale of 2 or more.

Exclusion criteria: Candidates having cognitive disorder, known disease affecting the musculoskeletal system, recent fever or chest infection and not willing to participate were excluded. Out of 118 patient 84 patient who met with the inclusion criteria and were willing to participate was recruited for the study while 34 candidates were excluded

STUDY PROCEDURE

All 84 geriatric persons fulfilling the inclusion criteria were divided in Group (A and B) using random sequence number generated by the computer. Both the groups were given diaphragmatic exercises at a frequency of 3 sessions per day for 6 days weekly till 4 weeks. Group A was additionally given Respiratory muscle stretch gymnastic exercise during the exercise period. Pre-treatment mMRC scale and 2 min walk test value was recorded. Following 4 weeks treatment again mMRC scale and 2 min walk test were taken. Between groups' pre and post treatment comparison was done using Mann-Whitney U test at 5% level of significance.

Figure:1 Showing elderly person performing RMSG

STATISTICAL ANALYSIS

Characteristic of the geriatric population such as age, physical health was analysed using descriptive analysis. The comparison between the two different treatments on the outcome score was done by using Mann-Whitney U test. Within group pre –post comparisons for 2 min walk test were carried out using paired t test and mMRC scale was compared using Wilcoxon signed rank test. The level of significant was set at p-value <0.05.

RESULT

Out of the total 118 candidates assessed for enrolment, 84 persons were recruited. They were divided into two groups each having 42 participants. During the intervention no untoward incidents were noted. The average age of the participants was 72.10 years.

[Table-1] shows that except mMRC scale, pre & post results for both the groups and 2 min walk test(in meters) pre values in group B all other values are not significant

at the test of normality, which means that except the above mentioned values other values follows the normality assumption. Thus for other values parametric test was used except mMRC scale pre & post for both the groups and 2 min walk test (in meters) pre values in group B, non-parametric test was used.

Table-1: Table shows test of normality between different variables.

Tests of Normality					
Variables	GROUP	Shapiro-Wilk			Remark
		Statistic	Df	P value	
AGE	GROUP A	.953	42	.082	NS
	GROUP B	.946	42	.05	NS
mMRC SCALE PRE	GROUP A	.742	42	.000	***
	GROUP B	.695	42	.000	***
mMRC SCALE POST	GROUP A	.769	42	.000	***
	GROUP B	.820	42	.000	***
2 MIN WALK TEST(in meters) PRE	GROUP A	.965	42	.216	NS
	GROUP B	.931	42	.014	*
2 MIN WALK TEST(in meters) POST	GROUP A	.965	42	.249	NS
	GROUP B	.946	42	.05	NS

NS-Not significant *Significant at p<0.05 **Significant at p<0.01

***Significant at p<0.001

Comparison of 2 min walk test in group A[Table-2] between pre and post treatment was done using paired t test and p value was seen to be less than 0.05, thus concluding that there is significant difference between pre and post values of 2 min walk test in group A at 5% level of significance.

Table-2: Comparison of 2 min walk test pre and post treatment in group A

Paired t –Test							
GROUP A	Paired Differences			t	df	P value	Remark
	Mean	Std. Deviation	Std. Error Mean				
2 MIN WALK TEST(in meters) PRE – 2 MIN WALK TEST(in meters) POST	-7.333	5.855	.903	-8.118	41	.000	***

***Significant at p<0.001

Comparison of mMRC scale in group A [Table-3] between pre and post treatment was done using Wilcoxon signed rank test (non-parametric) and p value was seen to be less than 0.05, thus it can be concluded that there is significant difference between pre and post values of mMRC scale in group A at 5% level of significance.

Table-3: Comparison of mMRC scale pre and post treatment in group A

Wilcoxon Signed Ranks Test			
GROUP A	Z	P value	Remark
mMRC SCALE POST - mMRC SCALE PRE	-5.549	.000	***

***Significant at p<0.001

Comparison of mMRC scale and 2 min walk test in group B [Table-4] between pre and post treatment was done using Wilcoxon signed rank test and seen to have p value less than 0.05, thus it can be concluded that there is a significant difference between pre and post values of mMRC scale and 2 min walk test in group B at 5% level of significance.

Table-4: Comparison of mMRC scale and 2 min walk test pre and post treatment in group B

Wilcoxon Signed Rank Test	
GROUP B	Z
mMRC SCALE POST - mMRC SCALE PRE	-4.472
2 MIN WALK TEST(in meters) POST - 2 MIN WALK TEST(in meters) PRE	-3.604

***Significant at p<0.001

Table-5: Comparison of 2 min walk test across group A and B

Independent Samples Test						
	t-test for Equality of Means					
	T	df	P value	Mean Difference	Std. Error Difference	Remark
AGE	-.588	82	.558	-.952	1.621	NS
2 MIN WALK TEST(in meters) POST	2.329	82	.022	5.048	2.167	*

*Significant at p<0.05

In [Table-5] independent t-test was used to analyse both the variables. The p value for age is greater than 0.05, thus we can conclude that there is no significant difference between values of age at 5% level of significance. But there is significant difference between the post values of 2 min walk test across the group A and group B at 5% level of significance as the p value for 2 min walk test (post) is greater than 0.05.

Table-6: Comparison of mMRC scale across group A and B

Test Statistics			
	Mann-Whitney U	P value	Remark
mMRC SCALE POST	503.000	.000	***

***Significant at p<0.001

In [Table-6] Mann-Whitney U test was used to analysed the variable and the p values was less than 0.05. Thus it can be concluded that there is significant difference between the post values of mMRC scale across the group A and B at 5% level of significance.

DISCUSSION

The present study was done to compare the effectiveness of respiratory muscle stretch gymnastic with diaphragmatic breathing exercise over diaphragmatic exercise alone on geriatric population who have complain of dyspnea and reduced exercise capacity. The current research results indicate that diaphragmatic exercise and respiratory muscle stretch gymnastic both bring beneficial effects on reducing dyspnea and increasing exercise capacity. The results reveal that 4 weeks of treatment reduces dyspnea and increases exercise capacity significantly in both the groups at $p< 0.05$ at 5% level of significance.

On comparing the two methods there is an evidence of higher increase in exercise capacity as determined by 2 min walk test (Mean ± SD: 156.62 ± 10.191 meters in group A vs 151.57 ± 9.665 meters in group B, $p< 0.05$) and a greater decrease in breathlessness scores on the mMRC scale (Mean ± SD: 1.38 ±0.492 in group A vs 1.98±0.780 in group B, $p< 0.05$) among the older adults.

CONCLUSION

The study concludes respiratory muscle stretch gymnastic when given with diaphragmatic exercise reduces dyspnea and increases exercise capacity more in geriatric population as compared to when diaphragmatic exercises are given alone. Although study results are encouraging, future research involving larger population and increased age group is recommended for validating the findings.. Additionally, understanding the long-term impact would help determine how these changes influence routine activities and the overall quality of life among the elderly population.

ACKNOWLEDGEMENT

The authors would like to express their sincere gratitude to the staff and residents of the old age homes in Guwahati for their invaluable support and participation in this study

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