

# Comparative Effectiveness of Low-Intensity Walking Versus Treadmill Walking Combined with Integrated Breathing on Dyspnoea in Elderly Asthmatic Subjects: A Randomized Comparative Study

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## Abstract

**Background:** Asthma in the elderly is frequently underdiagnosed and undertreated, contributing to increased dyspnoea, functional limitation, and reduced quality of life. Exercise-based pulmonary rehabilitation combined with breathing retraining has demonstrated beneficial effects; however, comparative evidence between different walking modalities remains limited.

**Objective:** To compare the effectiveness of low-intensity walking with integrated breathing and treadmill walking with integrated breathing on dyspnoea, pulmonary function, and quality of life in elderly individuals with asthma.

**Methods:** A randomized comparative experimental study was conducted among 40 elderly subjects (50–70 years) with mild to moderate asthma. Participants were randomly allocated into Group A (low-intensity walking with integrated breathing) or Group B (treadmill walking with integrated breathing). Both interventions were administered for 6 weeks. Outcome measures included the Modified Borg Dyspnoea Scale (MBD), Peak Expiratory Flow Rate (PEFR), and the Short-Form-36 Health Survey (SF-36). Within-group and between-group differences were analyzed using paired and independent *t*-tests at a significance level of  $p < 0.05$ .

**Results:** Both groups demonstrated statistically significant improvements in MBD, PEFR, and SF-36 scores following intervention ( $p < 0.001$ ). Between-group analysis revealed significantly greater improvements in PEFR and SF-36 scores in the treadmill walking group compared to the low-intensity walking group ( $p < 0.01$ ), while changes in dyspnoea scores were comparable between groups ( $p > 0.05$ ).

**Conclusion:** Low-intensity walking and treadmill walking combined with integrated breathing are effective interventions for improving dyspnoea, pulmonary function, and quality of life in elderly asthmatic subjects. Treadmill walking with integrated breathing demonstrated superior improvements in pulmonary function and health-related quality of life.

**Keywords:** Asthma; Elderly; Dyspnoea; Pulmonary Rehabilitation; Walking Exercise; Breathing Exercises

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## Introduction

Asthma is a chronic inflammatory disorder of the airways characterized by reversible airflow obstruction and bronchial hyper-responsiveness. Globally, asthma affects over 235 million individuals and remains a significant contributor to morbidity and mortality, particularly among older adults. Age-related physiological changes, delayed diagnosis, and multiple comorbidities render asthma management in the elderly especially challenging.

Dyspnoea is a hallmark symptom of asthma and a major determinant of reduced physical activity and impaired quality of life in older adults.

Pharmacological management alone is often insufficient to address functional limitations, highlighting the need for adjunct non-pharmacological strategies. Pulmonary rehabilitation incorporating aerobic exercise and breathing retraining has been shown to improve ventilatory efficiency, exercise tolerance, and symptom perception.

Walking-based exercise is a practical and accessible aerobic modality for elderly populations. Low-intensity walking is associated with better adherence and safety, whereas treadmill walking allows for controlled intensity and progression. When combined with integrated breathing techniques, both modalities may

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reduce dyspnoea perception and improve pulmonary outcomes. However, evidence directly comparing these two approaches in elderly asthmatic individuals is scarce.

Therefore, the present study aimed to compare the effects of low-intensity walking with integrated breathing and treadmill walking with integrated breathing on dyspnoea, pulmonary function, and quality of life in elderly asthmatic subjects.

### Methods Materials and Study Design

Randomized comparative experimental study.

Study Setting

Outpatient Department of Physiotherapy, Meenakshi College of Physiotherapy, MAHER. Chennai, India.

Participants

Forty elderly individuals aged 50–70 years with clinically diagnosed mild to moderate asthma were recruited following screening. Written informed consent was obtained from all participants.

Eligibility Criteria

**Inclusion Criteria:** - Age 50–70 years - Mild to moderate asthma (Modified Borg Dyspnoea Scale score 3–5) - History of dyspnoea for  $\geq 1$  year - Ability to participate in walking-based exercise

**Exclusion Criteria:** - Cardiovascular disease or unstable medical conditions - Active pulmonary infections (e.g., tuberculosis) - Neurological or cognitive impairment - Recent surgery - Severe asthma

Randomization and Allocation

Participants were randomly allocated into two groups (n = 20 each) using a simple randomization technique.

Interventions

#### Group A: Low-Intensity Walking with Integrated Breathing

Participants performed low-intensity over-ground walking (1.5–3.0 METs) for 35 minutes per session, three times per week for 6 weeks, including warm-up and cool-down phases.

#### Group B: Treadmill Walking with Integrated Breathing

Participants performed treadmill walking at a controlled speed (approximately 3 mph) for 35 minutes per session, three times per week for 6 weeks, under physiotherapist supervision.

#### Integrated Breathing Technique (Both Groups):

Breathing exercises included slow nasal inhalation followed by prolonged pursed-lip exhalation, with the expiratory phase twice as long as inspiration. Sessions were conducted for 20 minutes, five days per week.

Outcome Measures

Assessments were conducted at baseline and after 6 weeks: - Modified Borg Dyspnoea Scale (MBD) - Peak Expiratory Flow Rate (PEFR) - Short-Form-36 Health Survey (SF-36)

Statistical Analysis

Data were analyzed using descriptive statistics (mean  $\pm$  SD). Paired *t*-tests assessed within-group changes, and independent *t*-tests compared between-group differences. Statistical significance was set at  $p < 0.05$ .

### Results

Table 1. Baseline Demographic Characteristics of Participants

Variable	Group A (Low-Intensity Walking) (n=20)	Group B (Treadmill Walking) (n=20)	p-value
Age (years), mean $\pm$ SD	60.95 $\pm$ 5.51	60.25 $\pm$ 6.34	>0.05
Gender (M/F)	11 / 9	12 / 8	>0.05

Table 2. Within-Group Comparison of Outcome Measures (Pre- and Post-Intervention)

#### Group A: Low-Intensity Walking with Integrated Breathing

Outcome Measure	Post-test (Mean $\pm$ SD)		Mean Difference	p-value
	Pre-test (Mean $\pm$ SD)	SD		
PEFR (L/min)	257.25 $\pm$ 57.20	322.50 $\pm$ 67.60	+65.25	<0.001
MBD Score	3.85 $\pm$ 0.67	1.80 $\pm$ 0.62	-2.05	<0.001
SF-36 Score	72.95 $\pm$ 8.11	87.55 $\pm$ 7.32	+14.60	<0.001

#### Group B: Treadmill Walking with Integrated Breathing

Outcome Measure	Post-test (Mean $\pm$ SD)		Mean Difference	p-value
	Pre-test (Mean $\pm$ SD)	SD		
PEFR (L/min)	264.00 $\pm$ 56.77	380.25 $\pm$ 30.46	+116.25	<0.001
MBD Score	3.60 $\pm$ 0.94	1.50 $\pm$ 0.69	-2.10	<0.001
SF-36 Score	67.55 $\pm$ 8.12	92.40 $\pm$ 5.92	+24.85	<0.001

Table 3. Between-Group Comparison of Mean Changes in Outcome Measures

Outcome Measure	Group A Mean Change $\pm$ SD	Group B Mean Change $\pm$ SD	t-value	p-value
PEFR (L/min)	65.25 $\pm$ 43.72	116.25 $\pm$ 50.39	-3.42	0.002
MBD Score	2.05 $\pm$ 0.69	2.10 $\pm$ 0.64	-0.24	0.813

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Outcome Measure	Group A Change ± SD	Group B Change ± SD	Mean t-value	p-value
SF-36 Score	14.60 ± 5.92	24.85 ± 7.58	-4.77	<0.001

### Discussion

The present study demonstrates that structured walking programs combined with integrated breathing significantly improve dyspnoea perception, pulmonary function, and health-related quality of life in elderly asthmatic subjects. These findings support previous evidence highlighting the role of aerobic training and breathing retraining in asthma rehabilitation.

The superior outcomes observed in the treadmill walking group may be attributed to controlled workload, consistent intensity, and enhanced cardiopulmonary conditioning. Nevertheless, low-intensity walking also produced clinically meaningful improvements, emphasizing its feasibility and safety for elderly individuals who may not tolerate higher-intensity exercise.

### Limitations

- Relatively small sample size
- Short intervention duration
- Inclusion limited to mild and moderate asthma

### Conclusion

Both low-intensity walking and treadmill walking combined with integrated breathing are effective interventions for improving dyspnoea, pulmonary function, and quality of life in elderly asthmatic subjects. Treadmill walking with integrated breathing demonstrated superior improvements in pulmonary function and health-related quality of life, suggesting its preferential use when feasible in pulmonary rehabilitation programs for elderly individuals with asthma.

### Declarations

#### Ethics Approval and Consent to Participate

Ethical approval for this study was obtained from the Institutional Ethics Committee of Meenakshi College of Physiotherapy MAHER, Chennai. Written informed consent was obtained from all participants prior to study participation.

#### Consent for Publication

Not applicable.

#### Availability of Data and Materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

#### Competing Interests

The authors declare that they have no competing interests.

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### Authors' Contributions

All authors contributed to the conception and design of the study. Data collection, analysis, and manuscript preparation were performed collaboratively. All authors read and approved the final manuscript.

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