Pakistan Journal of Medical & Cardiological Review
https://pakjmcr.com/index.php/1/about
Online ISSN 3007-2387
Print ISSN 3007-2379

Combined Effects Of Buteyko And Paranayama Breathing Techniques For Cardiovascular Fitness And Quality Of Life Of Asthmatic Patients

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Keywords: Asthma, Quality Of Life, Buteykobreathing Technique, Cardiovascular Fitness, Pranayama Breathing Technique.

Received on 20 Mar 2026
Accepted on 17 Apr 2026
Published on 27 Apr 2026

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Abstract

Background: Asthma is a long-term lung disease, which causes inflamed airways, which become swollen, narrow and produce excessive mucus, making it difficult to breathe. Buteyko and Pranayama breathing techniques are breathing re-education strategies that alleviate respiratory and other health problems through re-education of abnormal breathing habits or patterns like chronic dysfunctional over-breathing and entails controlling the breath in order to bring the mind, body and spirit into union. **Aims and Objectives**: The objectives and aims of the given research were to observe the outcomes of the combination of two breathing exercises (Buteyko and Pranayama) to enhance Cardiovascular fitness and Quality of life of asthmatic patients and to reduce hyperventilation. **Material and Methodology:** A quasi-experimental study was conducted including a convenient sample of 60 patients with history of asthma. Baseline (pre-intervention) measurements were taken and the participants were then introduced to a four-month program of a structured breathing exercise program of a combination of the Buteyko and Pranayama to be performed on patients in both the public and the private Hospitals in Faisalabad. Training of the participants took 3 days and the participants were advised to perform the exercises 10 to 15 minutes twice daily along with conventional medical treatment.Oxygen saturation, Respiratory rate, Modified Borg Dyspnea Scale, Nijmegen Questionnaire, Asthma Quality of Life Questionnaire and the Six-minute walk test were assessed for post-intervention measurements.**Results:** By using paired sample T test analysis through SPSS there is statistically significant improvement with p value of< 0.001 .

Conclusion: It was concluded that both breathing techniques were proven to be effective in cardiovascular fitness and quality of life of asthmatic patient.

Introduction

Asthma is a chronic airway inflammatory disease with variable airflow obstruction and symptoms of the respiratory system, including wheezing, dyspnea, chest pain, and coughing (Global Initiative for Asthma [GINA], 2023). It ranks among the most prevalent non-communicated disorders across the globe, with an estimated 300 million people affected by this disorder; this trend is also on the increase, especially among the developing nations (Asher et al., 2020).

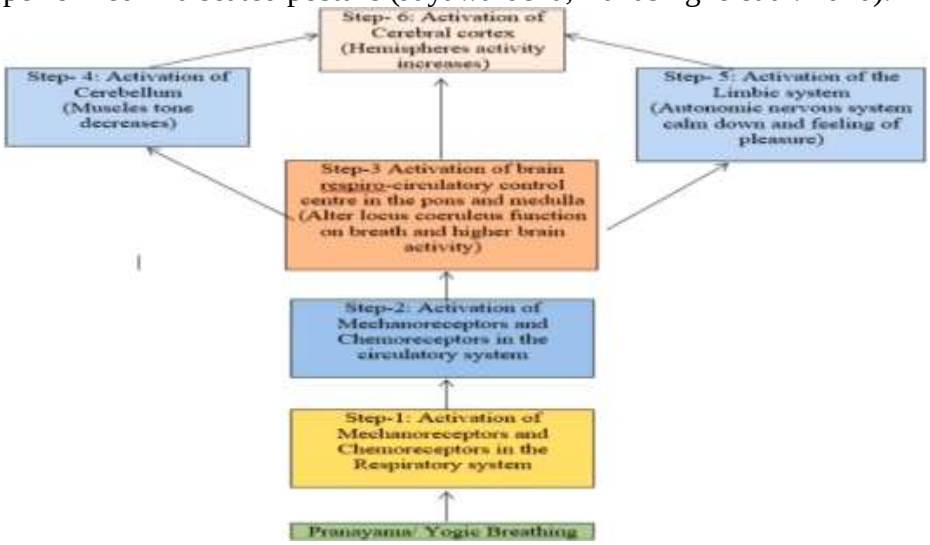
Poor healthcare facilities and lack of knowledge among the population make asthma to be underdiagnosed and undertreated in low and middle-income countries like Pakistan. The poor quality of air, biomass fuel exposure, and living overcrowds are only some of the environmental factors that contribute to disease prevalence. (Masoli et al., 2004).

In healthy physiological states, breathing occurs without having any kind of impediment in free movement of air through the respiratory tract. Airway smooth muscles are relaxed so that there is enough airflow, mucus traps dust and other pathogens and is moved with ciliary movement. This exchange of gases takes place in the alveoli whereby oxygen is diffused through blood and carbon dioxide elimination. It occurs by airway tone, which is controlled by the autonomic nervous system, where sympathetic system stimulates bronchodilation and parasympathetic system induces mild bronchoconstriction. The balance provides effective ventilation and oxygenation (West, 2012).

The pathophysiology of asthma is characterized by chronic inflammation in the airway mucosa, resulting in edema, hypersecretion of mucus and inflammatory cell (eosinophils, mast cells, and T lymphocytes) infiltration. The outcomes of this inflammatory cascade are airway narrowing and enhanced airways resistance causing the typical symptoms of asthma (Barnes, 2017).

The breathing methods (including Buteyko and Pranayama) have been used as an alternative remedy to asthma. These are procedures that emphasize on controlled breathing patterns that might reduce hyperventilation and enhancing respiratory efficiency (Holloway and Ram, 2004).

Pranayama is a Sanskrit word, which has been coined by joining two words that are; prana, which means breath of life/vital energy and ayama which means expansion/regulation/control.It is the breathing yoga; the conscious adjustments of the breathing process, which include rapid breathing with the diaphragm, slow/ deep breathing, alternate nostril breathing and breath holding/retention that are normally performed in a seated posture (Jayawardena, Ranasinghe et al. 2020).



(Mondal 2024)
The neural matters, temperature, hormones etc. under control of cardiovascular functions, of these, the neural factors mostly involve the autonomous nervous system which largely controls and regulates cardiac functions, e.g. blood pressure and heart rate.Slow form of yogic breathings have been reported to enhance the cardiovascular and autonomic variables that have the potential to be used in the prevention and management of cardiovascular diseases. (Nivethitha, Mooventhan et al. 2016)
The inventive way of treating bronchial asthma, with the 2000 and essentially new drug free technique is called The Buteyko Method of bronchial asthma cure (Konstantin Buteyko is its developer). He is the Ukrainian born medical scientist and medical practitioner who found out that the primary culprit that causes bronchospasm during bronchial asthma was CO2 deficiency in alveolar air caused by hyperventilation and low metabolic rate. He proved that hyperventilation is the primary factor of the etiology and pathogenesis of asthma. This mechanism was first described by him in 1952. (Hassan, Riad et al. 2012).
The buteyko breathing technique involves breathing through the nose, breathing with the diaphragms and breath-hold. Inspiration through breathing of the nose creates the opportunity to filter, humidify, and warm the air and diaphragmatic breathing enhances the expansion of the lung, and it escalates the intrapleural pressure. (Neşe and İpekçioğlu 2026)

Material and Methodology:
In this Quasi Experimental Study, we targeted to find Combined Effects of Buteyko and Pranayama Breathing Techniques for Cardiovascular Fitness and Quality of life in Asthmatic Patients.
To accomplish this, 60 patients from public and private hospitals of Faisalabad were informed with written consent before particicipation. Researchers used convenient sampling Technique for data collection**.**

Inclusion Criteria:
Participants included in this study were adults aged between 20 and 60 years, as supported by Kumar et al. (2023). Both male and female patients diagnosed with mild to moderate asthma having capability of understanding and following simple instructions and performing the prescribed exercise protocols were eligible. Patients not previously participated in any non-pharmacological treatment program, such as physical therapy interventions, were also included.

Exclusion Criteria:
Patients were excluded from the study if they had a history of emphysema, epilepsy, or kidney disease, as indicated by Mahmoud Abo El-Fadl (2024). Individuals with neuromuscular diseases, mental retardation, or psychological disorders , patients with severe bronchial asthma who required nasal cannula or continuous oxygen support were excluded.

Data Analysis:
All data was tested by using paired sample T Test. SPSS 21 was used to analyze the data. P value < 0.001 was considered to be statistically significant.

Results:
A paired sample t-test was conducted for each outcome measure and results indicate that every measured variable underwent a significant transformation over the course of the breathing program. The t-values obtained from the analysis ranging from 10.55 to 18.94 reflect a high degree of consistency in the positive response to the intervention. For instance, the significant t-value of 15.63 for the Borg Dyspnea Scale

and -16.21 for the AQLQ Score underscores. These values, coupled with a uniform significance level of $p < 0.001$, provide strong evidence that the improvements were not due to chance.

Ultimately, the paired sample t-test results confirm that the integrated Buteyko and Pranayama program is a highly effective physiological intervention. By demonstrating statistically significant improvements across respiratory, cardiovascular, and quality-oflife metrics, the data supports the adoption of these breathing exercises as a reliable method for enhancing the clinical status and functional capacity of individuals managing asthma and hyperventilation syndrome.

Paired Sample t-Test Results for All Outcome Variables

Variable	Pre Mean	Post Mean	t-value	Statistical Significance
SpO_2 (%)	94.2	97.1	13.42	$p < 0.001$ (Significant)
Respiratory Rate (b/min)	22.4	17.8	11.87	$p < 0.001$ (Significant)
Borg Dyspnea Scale	5.8	3.2	15.63	$p < 0.001$ (Significant)
Nijmegen Score	28.6	18.4	14.08	$p < 0.001$ (Significant)
AQLQ Score	3.9	5.4	−16.21	$p < 0.001$ (Significant)
6MWT Distance (m)	312.4	418.6	−18.94	$p < 0.001$ (Significant)
Resting Heart Rate (bpm)	92.3	78.4	12.77	$p < 0.001$ (Significant)
SpO_2 during 6MWT (%)	92.1	95.4	10.55	$p < 0.001$ (Significant)

The final assessment of the study's efficacy is captured through a comprehensive evaluation of the relative percentage changes across all primary and secondary outcome measures.Every monitored variable exhibited a change that was both clinically significant and statistically robust, providing a clear visual confirmation of the treatment's success.

The most relative improvement was observed in the Modified Borg Dyspnea Scale,which saw a remarkable reduction of −44.8%. This suggests that the intervention was exceptionally effective at lowering the subjective sensation of breathlessness, which is a primary driver of distress in asthma patients. Similarly, hyperventilation symptoms as measured by the Nijmegen Questionnaire decreased by −35.7%, indicating a much more stable and controlled breathing pattern among the participants. Respiratory and heart rate reductions of −20.5% and −15.1%, respectively, further corroborate this shift toward physiological homeostasis.

On the positive gain spectrum, the Asthma Quality of Life Questionnaire (AQLQ) scores showed the most significant upward trend with a +38.5% increase. This substantial gain in life quality is closely followed by a +33.9% improvement in the Six-Minute Walk Test (6MWT) distance, showcasing enhanced physical stamina and functional capacity and vital increases in oxygen saturation (SpO_2) further round out the results.

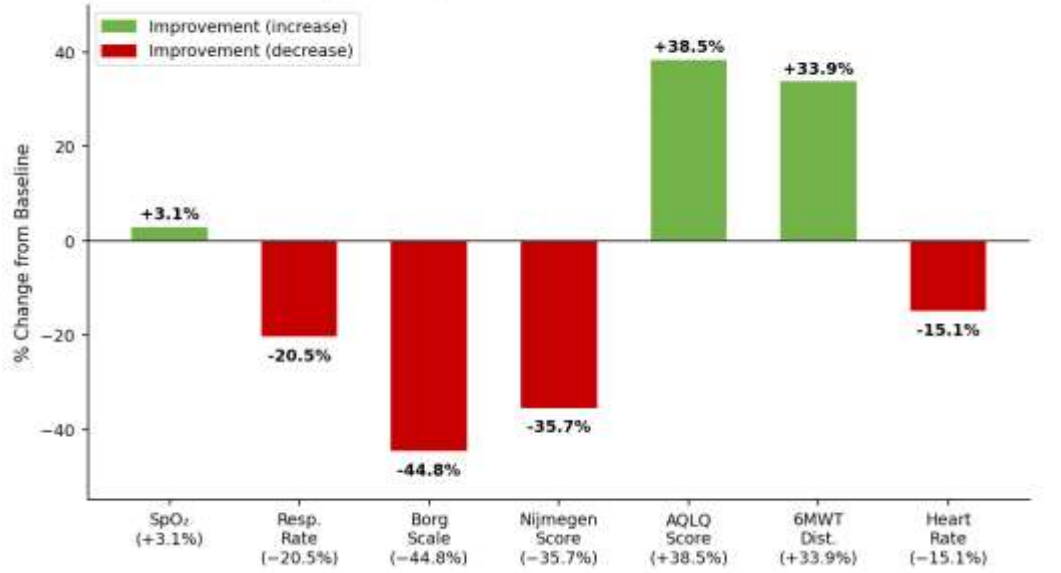
Percentage Change Analysis of Outcome Measures

Outcome Measure	Direction of Improvement	Percentage Change (%)	Clinical Interpretation
Modified Borg Scale	Decrease	-44.8%	Greatest Relative Improvement
AQLQ Score	Increase	+38.5%	Greatest Positive Gain
Nijmegen Score	Decrease	-35.7%	Significant Reduction in HVS
6MWT Distance	Increase	+33.9%	Enhanced Exercise Capacity
Respiratory Rate	Decrease	-20.5%	Improved Breathing Efficiency
Resting Heart Rate	Decrease	-15.1%	Reduced Autonomic Stress
SpO_2 (Baseline)	Increase	+3.1%	Improved Oxygenation

Summary of Percentage Changes in All Outcome Measures After 4-Month Intervention

The bar chart in serves as a definitive summary of the study's results. Green bars represent outcome measures where an increase indicates improvement (such as quality of life and walkingdi

Figure 11: Percentage Change in All Outcome Measures After Intervention



stance), while red bars represent measures where a decrease indicates success (such as heart rate, respiratory rate, and symptom scores). The clear distribution and magnitude of these bars provide an immediate visual understanding of how the integrated Buteyko and Pranayama program optimized every facet of the participants' respiratory health.

Discussion:

The present study demonstrated a statistically significant improvement in oxygen saturation (SpO_2) from 94.2% to 97.1% ($p < 0.001$) following the four-month combined breathing exercise program. This finding is consistent with the results of Ramanathan and Bhavanani (2023), who reported significant increases in SpO_2 following a single session of Pranava Pranayama. Similarly, Gokhale et al. (2018) demonstrated that Kapalabhati Pranayama practice significantly increased oxygen

saturation in novices. From a physiological perspective, the Buteyko Breathing Method reduces hyperventilation and promotes carbon dioxide retention, which facilitates improved oxygen delivery to tissues via the Bohr effect. Pranayama complements this by promoting slow, deep, and controlled breathing, which increases alveolar ventilation and reduces ventilation-perfusion mismatch. The combined effect of both techniques thus appears to synergistically enhance oxygenation in asthmatic patients.

A significant reduction in respiratory rate from 22.4 to 17.8 breaths/min ($p < 0.001$) was observed in the present study. This finding is in accordance with Dhaniwala et al. (2020), who reported that pranayama breathing exercises normalize respiratory patterns and reduce the frequency of breathing. The Buteyko method specifically targets chronic over-breathing by training patients to adopt nasal, diaphragmatic breathing with reduced volume, thereby decreasing respiratory rate over time. A lower respiratory rate is associated with reduced work of breathing, improved gas exchange efficiency, and better autonomic balance. This reduction reflects meaningful physiologicaladaptation in the breathing control mechanism, which is fundamental to improving cardiovascular fitness in asthmatic patients.The present study reported a marked reduction in perceived dyspnea, as measured by the Modified Borg Dyspnea Scale, from a mean score of 5.8 to 3.2 ($p < 0.001$), representing a 44.8% improvement. This finding is consistent with previous research by Agarwal et al. (2017), who reported significant reductions in breathlessness and wheezing following structured pranayama interventions in asthma patients. Hassan et al. (2022) also reported significant reductions in dyspnea symptoms following the Buteyko Breathing Technique in school-age children. The alleviation of dyspnea can be attributed to the improvement in breathing efficiency, reduced airway reactivity, and the anxiolytic effects of controlled breathing. Reduced dyspnea significantly enhances tolerance to physical activity, which is an important determinant of cardiovascular fitness.

A substantial reduction in Nijmegen Questionnaire scores from 28.6 to 18.4 ($p < 0.001$) was observed, with post-intervention scores falling below the clinical threshold of 23 for hyperventilation syndrome. This finding strongly supports the effectiveness of the Buteyko technique, which is specifically designed to address chronic hyperventilation by improving carbon dioxide tolerance. Mohamed et al. (2018) and Hassan et al. (2022) both confirmed that the Buteyko Breathing Technique significantly reduces hyperventilation symptoms in asthmatic patients. Pranayama further complements this through its emphasis on slow, rhythmic exhalation and breath awareness, which promotes normalization of breathing patterns. The reduction in hyperventilation is clinically significant as it reduces associated symptoms such as dizziness, chest tightness, and air hunger, all of which contribute to reduced physical activity and poor cardiovascular fitness.

The Asthma Quality of Life Questionnaire (AQLQ) scores improved significantly from 3.9 to 5.4 ($p < 0.001$), with the change exceeding the Minimal Clinically Important Difference (MCID) of 0.5. This finding is consistent with multiple previous studies. Yüce and Taşcı (2020) demonstrated that pranayama significantly improved asthma control and AQLQ scores in a randomized controlled trial. Khan et al. (2024) reported higher patient satisfaction and quality of life among patients receiving Buteyko Breathing Technique compared to diaphragmatic breathing. Çelik and Yuruk (2025) similarly confirmed that Buteyko significantly improved quality of life in pediatric asthma patients. The improvement in AQLQ scores suggests gains across all four domains: symptoms, activity limitations, emotional function, and environmental stimuli. These improvements collectively indicate a meaningful enhancement in the daily functional capacity and psychological well-being of asthmatic patients following the combined intervention.The primary outcome of this study, cardiovascular fitness as measured by the 6MWT, demonstrated a highly significant improvement. The mean 6MWT distance increased from 312.4 m to 418.6 m ($p < 0.001$), an absolute

improvement of 106.2 m, which far exceeds the established MCID of 30–35 m for chronic respiratory patients (Puhan et al., 2008). Concurrent improvements were observed in SpO_2 during the 6MWT and in resting heart rate, providing a comprehensive improvement in cardiopulmonary efficiency.These findings are consistent with the 2022 evidence synthesis by Anshu et al., which reported that combined breathing and physical training interventions improveaerobic capacity and reduce fatigue in asthma patients. The 2024 systematic review by Yadav et al. also confirmed that combined breathing regimens enhance cardiopulmonary coordination and reduce sympathetic overactivity. The physiological basis for this improvement lies in the fact that breathing exercises reduce ventilatory inefficiency, improve oxygen utilization, and decrease exertional dyspnea all of which allow patients to sustain higher levels of physical activity with less cardiopulmonary strain.

From a clinical perspective, these findings suggest that physiotherapists, respiratory therapists, and healthcare professionals should actively consider incorporating structured breathing exercise programs into routine asthma rehabilitation protocols. The simplicity and low cost of these techniques, requiring no equipment and only 10–15 minutes of daily practice, further support their practical implementation, particularly in resource-limited settings such as the public hospitals of Faisalabad where this study was conducted.

Conclusion:

In conclusion, the results of the present study indicate that the combined use of Buteyko and pranayama breathing techniques significantly improves respiratory parameters by increasing oxygen saturation, reduces symptoms like hyperventilation, dyspnea and enhances functional exercise capacity in asthmatic patients. These improvements collectively contribute to better cardiovascular fitness and quality of life of asthmatic patients and support the inclusion of breathing exercises as an adjunct to conventional asthma management.

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