# The impact of compare yoga and aerobic on asthma control, pulmonary function, and quality of life

*El impacto de comparar el yoga y el ejercicio aeróbico en el control del asma, la función pulmonar y la calidad de vida*


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## Abstract

Introduction: The respiratory symptoms of asthma, a chronic airway disease that fluctuates in frequency, severity, and occurrence over time, include wheezing, dyspnea, chest tightness, and coughing. Numerous things, including physical activity, exposure to allergens and/or irritants, changes in the weather, and viral respiratory infections, can cause these variances.
Objective: The effects of yoga and aerobic workouts on asthmatic patients' quality of life, pulmonary function, and asthma control were evaluated in this study.
Methodology: In addition to their usual treatment, the aerobic and yoga groups participated in 45-minute aerobic and yoga sessions three times a day for three months. The pulmonary function test (PFT), the asthma control test (ACT), the asthma quality of life questionnaire (AQLQ), and patient observation records were among the tools utilized to gauge the outcomes.
Results: The yoga group had considerably higher ($p < 0.05$) ACT, overall AQLQ, and subscale scores than the cardio group. Peak expiratory flow values and PFT parameters, however, did not significantly differ across the groups ($p > 0.05$).
Discussion: This study sought to evaluate the effects of yoga, aerobics, and a control group on asthma control in a comprehensive manner, focusing on the ways in which these activities impact breathing functions, quality of life, and asthma management in asthmatic persons.
Conclusion: Yoga improved asthmatics' quality of life and asthma control, but it had no discernible effect on PFT levels.



## Keywords

Asthma; asthma control; yoga; aerobic; quality of life.



## Resumen

Introducción: Los síntomas respiratorios del asma, una enfermedad crónica de las vías respiratorias cuya frecuencia, gravedad e incidencia fluctúan con el tiempo, incluyen sibilancias, disnea, opresión torácica y tos. Numerosos factores, como la actividad física, la exposición a alérgenos o irritantes, los cambios climáticos y las infecciones respiratorias virales, pueden causar estas variaciones.
Objetivo:En este estudio se evaluaron los efectos del yoga y el ejercicio aeróbico en la calidad de vida, la función pulmonar y el control del asma de pacientes asmáticos.
Metodología: Además de su tratamiento habitual, los grupos de ejercicio aeróbico y yoga participaron en sesiones de 45 minutos de ejercicio aeróbico y yoga tres veces al día durante tres meses. La prueba de función pulmonar (PFP), la prueba de control del asma (ACT), el cuestionario de calidad de vida para el asma (AQLQ) y los registros de observación de los pacientes fueron algunas de las herramientas utilizadas para evaluar los resultados.
Resultados: El grupo de yoga obtuvo puntuaciones considerablemente más altas ($p < 0,05$) en el ACT, el AQLQ general y las subescalas que el grupo de cardio. Sin embargo, los valores de flujo espiratorio máximo (FEM) y los parámetros de las PFT no mostraron diferencias significativas entre los grupos ($p > 0,05$).
Discusión: Este estudio buscó evaluar los efectos del yoga, los ejercicios aeróbicos y un grupo control en el control del asma de forma integral, centrándose en cómo estas actividades impactan la función respiratoria, la calidad de vida y el manejo del asma en personas asmáticas.
Conclusión: El yoga mejoró la calidad de vida y el control del asma en personas asmáticas, pero no tuvo un efecto perceptible en los niveles de las PFT.



## Palabras clave

Asma; control del asma; yoga; ejercicios aeróbicos; calidad de vida.

## Introduction

The respiratory symptoms of asthma, a chronic airway disease that fluctuates in frequency, severity, and occurrence over time, include wheezing, dyspnea, chest tightness, and coughing. Numerous things, including physical activity, exposure to allergens and/or irritants, changes in the weather, and viral respiratory infections, can cause these variances. Asthma is frequently linked to bronchial hyperresponsiveness (BHR) and chronic airway inflammation, both of which can be treated to alleviate symptoms even when they are absent or lung function is normal (Tan et al., 2022). Consequently, the disease is extremely common and severe, impacting as many as 18% of the population in certain nations (Chung et al., 2014; Demoly et al., 2009). In order to manage symptoms and lower the chance of an exacerbation, asthma treatment should begin as soon as feasible after diagnosis. Despite improvements in pharmaceutical therapy, symptoms are widespread and achieving good clinical control is challenging for people with moderate to severe asthma. As a result, GINA recommends nonpharmacological therapies include breathing techniques, exercising, quitting smoking, and avoiding indoor allergens. Physical training is one of these non-pharmacological treatments that has been shown in multiple systematic studies to be crucial for asthma management (Mukherjee et al., 2016; Peters et al., 2007).

Yoga and aerobic exercise both improved airway inflammation, clinical control, quality of life (QoL), asthma symptoms, psychological distress, and physical activity levels in individuals with moderate to severe asthma, according to a recent study (Cazzoletti et al., 2007; Ogbu et al., 2023; Slader et al., 2006). To illustrate the pathways that exercise training stimulates, more research has been done. Despite recent advancements, exercise is still generally discouraged for those with asthma because of the risk of exercise-induced bronchoconstriction (EIB). However, since 2000, some studies have shown that physical activity can improve health metrics related to clinical asthma control, aerobic potency, and quality of life while lowering EIB, bronchial hyperresponsiveness, medication use, and systemic and airway inflammation (Ward & Baptist, 2016).

It has been demonstrated that a variety of exercises, including yoga, tai chi, and upper-limb movements, can enhance the quality of life for asthmatics. Yoga has been demonstrated to enhance mind-body coordination, making it a suggested exercise element for pulmonary rehabilitation regimens. It can also be used as an adjunct to physical therapy in rehabilitation programs. Because yoga is a "low impact" practice that can be tailored to the requirements and capacities of its practitioners through its asana (yoga postures) and breathing techniques, it is appropriate for those with asthma. In short-term trials, yoga practice has been associated with increases in quality of life, diffusion capacity, lung function, and stress reduction from dyspnea (George & Topaz, 2013; Yang et al., 2016a).

In addition to yoga, asthmatic patients can benefit from aerobic activity. According to epidemiological studies, aerobic exercise lowers the risk of chronic diseases and increases life expectancy. Along with the growth of muscle fibers, aerobic activity also causes the mitochondria to enlarge, increasing the amount of energy that the muscles can consume without becoming fatigued. This satisfies the needs of asthmatics who have shortness of breath and fatigue easily, which restricts their daily activities. This adaptation reduces the risk of illness and death, promotes better health, and improves quality of life (Cramer et al., 2014; Nagarathna & Nagendra, 1985; Posadzki & Ernst, 2011). The differences in observed clinical results may be due to the fact that yoga and aerobic exercise do not improve forced peak expiratory flow and asthma management through bronchial smooth muscle relaxation and decreased respiratory rate. It is unknown if yoga, as opposed to cardiovascular exercise, improves clinical outcomes for asthma patients by reducing respiratory rates and relaxing bronchial smooth muscles.

To ascertain whether yoga exercise has a different therapeutic effect on asthmatic patients than conventional aerobic exercise by reducing respiratory rates and relaxing bronchial smooth muscles. In order to improve forced peak expiratory flow and control asthma by relaxing bronchial smooth muscles and lowering respiratory rate, the study compared the therapeutic effects of using yoga and aerobic exercise.

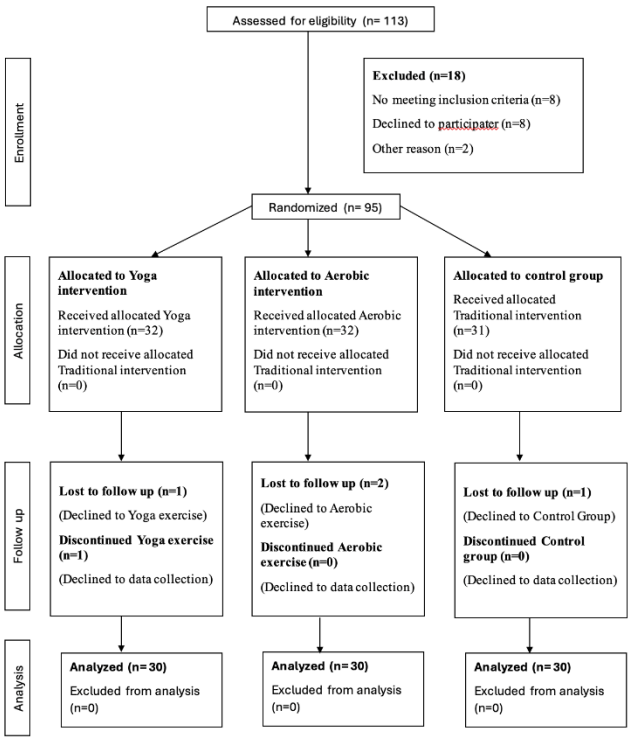
## Method

This randomized controlled trial sought to ascertain the effects of 45-minute aerobic exercise and yoga on the quality of life, pulmonary function, and asthma control in patients with asthma over a three-month period.

### *Participants*

The study was conducted at Universitas Negeri Yogyakarta's physiology lab between October 2024 and January 2025. The Academy of Higher Education and Research includes Universitas Negeri Yogyakarta's ethics committee. In order to sustain the study, power analysis was performed in reference to the data from the sample group. After each group had 32 patients for yoga group, 32 aerobic group, and 31 control group for a total of 95 patients, power analysis was carried out (Fig.1). The effect size was found to be 1.03 and the study power was found to be 97% after power analysis using the GPower 3.1 program to compute the difference in ACT scores before and after the treatments. To identify a 3-point difference in ACT scores, the parameters for analysis were set at a 0.05 α-value and a 0.20 β-value (Erdoğan Yüce & Taşcı, 2020).

Figure 1. The study's CONSORT chart.




### *Inclusion and Exclusion Criteria*

Participants had to be at least eighteen years old, able to communicate, treated for six months after being diagnosed with chronic asthma, have asthma that is not under control or partially under control based on Global Initiative for Asthma values, be taking a beta2 agonist and/or inhaling a corticosteroid twice a week or more to control symptoms, have not changed the dosage of their inhaler bronchodilator medication in the last four weeks, and be able to use a smartphone. Participants in the study were excluded if they had severe asthma (predicted FEV1 ˂ 60%), lung conditions like COPD, TB, respiratory infections, diabetes, and coronary artery disease, smoked, were pregnant or nursing, regularly exercised, or benefited from other complementary and integrative health applications during treatments. Each patient provided their agreement after being fully informed about the study's goals, intervention techniques, patient rights, advantages, and possible dangers. Those who wished to stop,

did not engage in more than 15% of the applications, or did not correctly apply the breathing method were also removed.

### *Randomization procedure*

To guarantee homogeneity in randomization, the patients were grouped according to their age, sex, Asthma Control Test (ACT) scores, and Asthma Quality of Life Questionnaire (AQLQ) scores after receiving their pretest results. Double blocks were created based on the characteristics of the grouped patients. Using simple random selection, the patients were divided into three groups: the aerobic group, the yoga group, and the control group. Each group was given a 1:1 ratio. A research assistant who was not involved in the trial chose the first patient using an opaque envelope with the name of the yoga group on it. The second patient with comparable characteristics was then immediately assigned to the opposing group. The sampling process continued until the categories and blocks for each of the three groups were equal. Each randomly selected patient was contacted prior to the initial interview, and training was scheduled at the time of the appointment. As a result, none of the patients interacted with one another. The study groups were not disclosed to the patients or the interviewer who was gathering post-test data.

Intervention

#### *Yoga intervention*

Standard of care treatment, breathing exercises, relaxation methods, asanas (postures), yoga (breathing exercises), and meditation and relaxation are all examples of yoga therapies. The patients will initially receive five sessions from a yoga trainer. Following that, we produced a unique 45-minute video of the yoga module with comprehensive instructions that customers can regularly practice. To check on the patients' adherence to daily yoga practice, phone calls and visits to their homes were conducted every three days in one weeks. We informed each patient that they needed to notify the researcher of any difficulties or unfavorable outcomes.

#### *Aerobic*

A vigorous warm-up, aerobic activities, and intense resistance training comprised the 60-minute aerobic workout. Breathing and mobility exercises were part of the fifteen-minute warm-up. A 30-minute monitored cycling session on a bicycle ergometer with an intensity grade of 7–8 (very heavy) on the Borg 1–10 scale of perceived exertion comprised the aerobic component of the exercise (Sangeethalaxmi & Hankey, 2023)

Control

Standard care was given to the control group. During the intense phase of therapy, which lasted eight weeks according to the NTEP, newly diagnosed PTB patients got the first line of anti-TB medications, including isoniazid [H], rifampicin [R], pyrazinamide [Z], and ethambutol [E] [HRZE]. These four HRZE medications were given in a predetermined dosage combination based on weight ranges. Since all of the required medications are contained in a single tablet, a fixed dose combination offers an easy method of administering the appropriate dosage and quantity of medication. It is given with the H/R/Z/E medications that are used to treat tuberculosis (Klafke et al., 2023).

#### *Outcome measure*

Asthma Control Test (ACT)

The frequency of shortness of breath and other general asthma symptoms, the use of rescue drugs, the impact of asthma on day-to-day functioning, and the overall self-assessment of asthma treatment are the five primary components of ACT. Each item required a response from the patient, with 1 denoting always and 5 denoting never for symptoms and activities, and 1 denoting never and 5 denoting fully controlled asthma. These five questions have a total score that varies from 5 to 25 (Sengupta, 2012; Vedanthan, 1998). This study employed the same form as validity and reliability studies (Govindaraj et al., 2016). This form is used to evaluate patient scores in the manner described below: Asthma is classified as "not controlled" if the score is less than 19, "partly controlled" if it is between 24 and 20, and "completely controlled" if it is 25. For ACT, the Cron-bach's α value was 0.84 (George & Topaz, 2013; Sangeethalaxmi & Hankey, 2023).

#### *Asthma Quality of Life Questionnaire (AQLQ)*

The typical AQLQ consists of 32 questions and is a quality-of-life questionnaire tailored to asthma (Jerath, 2016; Prem et al., 2013). Using a seven-point rating system (1 being severely hindered and 7 being not impaired at all), the questionnaire assesses responses based on changes associated to asthma during the previous two weeks. Twelve questions deal with symptoms, eleven with activity limitation, five with emotional functions, and four with external stimuli in the standard AQLQ. Both the subscale and total scores' mean values are determined. The mean of the scores that were obtained falls between 1 and 7. The change is referred to as a "minimal significant difference" and the lowest clinically admissible score change is 0.50 (Cooper et al., 2003; Govindaraj et al., 2016; Saoji et al., 2019; Vedanthan, 1998). The reliability and validity of the questionnaire were assessed. Symptoms had Cronbach's α values of 0.87, activity limitation had 0.87, emotional functions had 0.83, and environmental stimuli had 0.81 (Cooper et al., 2003; Govindaraj et al., 2016; Saoji et al., 2019; Vedanthan, 1998).

*Pulmonary Function test (PFT)*

PFT is useful for both diagnosing and monitoring asthma. FEV1 is the best measure of airway blockage in asthma and is obtained during a respiratory function test and flow velocity determination. But because it is primarily correlated with breathing effort, FEV1 only represents actual airway obstruction when there is a strong and maximal breathing effort. The breathing effort-related component of FVC reflects lung elastic recession power, pulmonary expiratory muscle strength, and airway health. In the early stages of asthma, the FEV1/FVC ratio is an essential last parameter for diagnosing airway blockage because most people do not show a significant decrease in FVC values. The FEV1/FVC ratio is a criterion for airway occlusion, per the majority of guidelines. FEV1 determines the severity of the condition. In order to diagnose and treat asthma, PEF measurement is one type of test that may be performed with portable, handheld equipment that let patients monitor their health while they are at home (Ai Thi HOANG, 2015; Raghavendra et al., 2016; Singh et al., 2012). The optimal PEF value is largely determined in PEF follow-up since a patient's follow-up is carried out based on his or her optimal PEF value rather than the expected value determined by spirometry (Ai Thi HOANG, 2015; Raghavendra et al., 2016; Singh et al., 2012).

### *Data analysis*

AQLQ scores, PFT parameters, PEF values, and ACT scores were all analyzed. The data was evaluated using IBM SPSS 28.0, a statistics package application developed by IBM Corporation, a company headquartered in Armonk, New York. Fisher's exact test and the chi-square test were employed to assess the differences in the descriptive variables. The distribution of numerical values was examined using the Shapiro-Wilk normality test, and the homogeneity of variances was examined using Levene's test. The Mann-Whitney U-test and the independent-samples t-test were used to compare the two groups. Repeated measures within the same group were assessed using Wilcoxon's paired-samples test and the paired-samples t-test. In this investigation, a P-value of less than 0.05 was deemed statistically significant.

## Results

The descriptive attributes of the participants in both groups are shown in Table 1. There was no appreciable difference between the groups in this regard ($p > 0.05$). The distributions of PFT values, ACT scores, and AQLQ scores in the yoga and relaxation groups prior to and following therapy are displayed in Table 2. Before therapy began, the ACT scores of the two groups were similar ($p > 0.05$). Nevertheless, the ACT scores of the yoga group were significantly higher than those of the rest group after treatment application ($p < 0.05$). Additionally, both groups' ACT scores significantly increased after applying therapy ($p < 0.05$).

Prior to and during treatment application, there was no significant difference in FEV1, FVC, FEV1/FVC, or PEF between the groups ($p > 0.05$); however, the mean PEF value of the yoga group increased considerably following treatment application ($p < 0.05$). The mean scores for the two groups' subscales and overall AQLQ were similar before therapy began and did not differ substantially ($p > 0.05$). The overall AQLQ and sub-scale ratings of the yoga group were significantly higher than those of the

relaxation group after the treatment was implemented ($p < 0.05$). Furthermore, both groups' overall AQLQ and subscale scores were significantly higher ($p < 0.05$) after therapy application.

Table 1. Participants' descriptive characteristics in the aerobic, yoga, and control groups

| | Yoga group | Exercise group | Control group | p |
|---|---|---|---|---|
| Age (mean±SD) (years) | 43.18 ± 10.29 | 42.74 ± 8.63 | 42.62 ± 9.35 | 0.247a |
| Diagnosis time (mean±SD) (year) | 9.43 ± 6.24 | 9.35 ± 7.24 | 9.26 ± 6.43 | 0.631a |
| Number of attacks per year (mean±SD) | 5.48 ± 4.36 | 6.52 ± 4.78 | 6.52 ± 4.78 | 0.381a |
| Gender | | | | |
| Males | 11 | 16 | 12 | 1.001b |
| Females | 19 | 14 | 18 | |
| Education | | | | |
| Uneducated | 3 | 4 | 3 | 0.211b |
| Primary School | 6 | 7 | 8 | |
| Middle School | 8 | 8 | 9 | |
| High School | 5 | 4 | 4 | |
| University | 8 | 7 | 6 | |
| Marital status | | | | |
| Married | 14 | 11 | 12 | 0.634b |
| Unmarried | 16 | 19 | 18 | |
| Family asthma story | | | | |
| Yes | 13 | 18 | 11 | 0.254b |
| No | 17 | 12 | 19 | |
| Allergy story | | | | |
| Yes | 19 | 14 | 16 | 0.481b |
| No | 11 | 16 | 14 | |
| Emergency service application for asthma in the last 3 months | | | | |
| Yes | 17 | 15 | 20 | 0.417b |
| No | 13 | 15 | 10 | |
| Use of rescue medications | | | | |
| Yes | 10 | 13 | 12 | 0.072b |
| No | 20 | 17 | 18 | |

Note. SD: Standard deviation.
a Obtained from the independent-samples t-test.
b Obtained from the chi-square test.

Table 2. ACT, PFT, and AQLQ changes within and between the aerobic, yoga, and control groups are compared.

| | Yoga group | | Within-group p-valuea | Aerobic group | | Within-group p-valuea | Control group | | Within-group p-valuea | Pretest between groups p-valueb,c | Posttest between groups p-valueb,c |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Baseline | Post-test | | Baseline | Post-test | | Baseline | Post-test | | | |
| Asthma Control Test (Mean ± SD) | 14.58 ± 3.42 | 19.58 ± 3.13 | < 0.001a | 14.96 ± 3.64 | 16.21 ± 3.83 | < 0.004a | 14.72 ± 3.52 | 14.75 ± 3.53 | < 0.003a | 0.664b | 0.035c |
| Pulmonary Function Tests | | | | | | | | | | | |
| FEV1 (L) | 3.68 ± 0.35 | 3.89 ± 0.43 | 0.648a | 3.45 ± 0.74 | 3.53 ± 0.81 | 0.759a | 3.38 ± 0.74 | 3.39 ± 0.75 | 0.514a | 0.136b | 0.084b |
| FVC (L) | 3.28 ± 0.63 | 3.31 ± 0.78 | 0.475a | 3.24 ± 0.33 | 3.29 ± 0.48 | 0.445a | 3.24 ± 0.35 | 3.25 ± 0.37 | 0.444a | 0.086b | 0.237b |
| FEV1/FVC (%) | 74.68 ± 6.13 | 75.28 ± 5.26 | 0.271a | 74.15 ± 6.25 | 72.18 ± 6.21 | 0.071a | 74.11 ± 6.15 | 75.18 ± 6.17 | 0.052a | 0.615c | 0.459c |
| PEF (mL/min) | 458.32 ± 127.73 | 482.58 ± 148.89 | 0.004a | 438.21 ± 122.51 | 441.28 ± 124.19 | 0.319a | 434.11 ± 112.21 | 435.18 ± 112.29 | 0.373a | 0.185b | 0.091c |
| Asthma Quality of life Questionnaire (Mean ± SD) | | | | | | | | | | | |
| Symptoms | 5.47 ± 1.25 | 7.88 ± 0.38 | < 0.001a | 5.31 ± 1.35 | 7.21 ± 1.38 | < 0.001a | 5.37 ± 1.23 | 5.48 ± 1.28 | < 0.001a | 0.882b | 0.001c |
| Activity limitation | 5.18 ± 1.73 | 7.82 ± 0.63 | < 0.001a | 4.25 ± 1.41 | 7.82 ± 1.42 | < 0.001a | 5.05 ± 1.37 | 5.12 ± 1.38 | < 0.001a | 0.782b | 0.001b |
| Emotional function | 5.88 ± 1.43 | 7.85 ± 0.13 | < 0.001a | 5.52 ± 1.39 | 7.85 ± 1.53 | 0.059a | 5.66 ± 1.19 | 5.68 ± 1.23 | 0.068a | 0.679b | 0.001b |
| Environmental stimuli | 5.58± 1.13 | 7.87 ± 0.84 | < 0.001a | 5.67 ± 1.28 | 7.87 ± 1.35 | 0.042a | 5.44 ± 1.18 | 5.45 ± 1.19 | 0.051a | 0.6692b | 0.023b |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Total score | 5.58 ± 1.93 | 5.93 ± 1.97 | < 0.001a | 5.42 ± 1.53 | 5.51 ± 1.55 | < 0.001a | 5.37 ± 1.41 | 5.38 ± 1.42 | < 0.001a | 0.928b | < 0.001b |

Note. SD: Standard deviation. FEV1: Forced expiratory volume in the first second. FVC: Forced vital capacity. FEV1/FVC: Tiffeneau–Pinelli index. PEF: Peak expiratory flow. Bold p values are statistically significant (< 0.05).
a Obtained from the Wilcoxon test.
b Obtained from the independent-samples t-test.
c Obtained from the Mann–Whitney U test.

## Discussion

This study sought to evaluate the effects of yoga, aerobics, and a control group on asthma control in a comprehensive manner, focusing on the ways in which these activities impact breathing functions, quality of life, and asthma management in asthmatic persons. Yoga improved quality of life and asthma control, but it did not significantly improve breathing abilities, according to the study.

Before therapy, both groups' ACT scores—a measure used in this study to evaluate the effect of yoga on managing asthma—were incredibly low. However, following treatment, the yoga group's ACT scores significantly increased as compared to the aerobic group. Additionally, the yoga group's asthma treatment was noticeably better than that of the cardio group. A study by Karam et al. that examined the impact of breathing techniques like yoga on asthma control and quality of life found similar outcomes. Additionally, ACT scores before and after the breathing exercise program were compared in the study. The ACT scores of asthmatic patients increased significantly as a result of the combined breathing exercises (Bahçecioğlu Turan & Tan, 2020; Kant & Agnihotri, 2013; Karam et al., 2017; Mekonnen & Mossie, 2010; Murthy et al., 2017; Sewa & Ong, 2014). Compared the effects of Buteyko and Pranayama on asthma patients using an asthma control questionnaire. Though there was no discernible difference between the Buteyko and yoga groups, both groups had a decrease in symptom scores (Klafke et al., 2023; Swathi et al., 2021; Vedanthan, 1998; Vempati et al., 2009). After therapy, the yoga group's symptom scores significantly decreased, according to an evaluation of yoga's impact on asthmatic patients using the St. George's Respiratory Questionnaire (Cramer et al., 2014; George & Topaz, 2013; Posadzki & Ernst, 2011; Ward & Baptist, 2016; Yang et al., 2016b). The benefits of yoga exercises on bronchial asthma were studied, and similar findings were found (Cazzoletti et al., 2007; Demoly et al., 2009; Mukherjee et al., 2016; Peters et al., 2007). According to a study assessing yoga as an additional treatment for asthma control, the yoga group outperformed the control group in terms of asthma symptoms, especially daytime symptom scores (Chung et al., 2014; Demoly et al., 2009; Tan et al., 2022). the clinical benefits of yoga on asthma and found that the yoga group experienced a relative reduction in both daytime and nocturnal asthma attacks when compared to the control group (Mukherjee et al., 2016; Peters et al., 2007). These studies' findings showed that yoga reduced asthma symptoms and enhanced asthma control.

Regarding asthma management, there was no discernible change in FEV1, FVC, or FEV1/FVC values between the current study groups. Numerous research have demonstrated that yoga has a favorable impact on PFT values, which runs counter to these findings. Bhatt and Rampallivar, for instance, looked into how yoga affected the PFT parameters of asthmatic patients. After three months of treatment, they demonstrated that the yoga group's FEV1, FVC, and FEV1/FVC values considerably rose when compared to the control group's values (Fukuoka et al., 2016; Papp et al., 2017; Satyanand et al., 2014). Similar findings were found in studies that looked at the benefits of yoga for people with asthma (Anshu et al., 2023; Li et al., 2020; Murthy et al., 2017). examined the impact of a yoga-based lifestyle on the treatment of bronchial asthma and discovered that, in contrast to traditional treatment and yoga application, the yoga group's FEV1 and FEV1/FVC values were significantly greater than those of the control group (Agnihotri et al., 2017; Pandit & Vaidya, 2013; Raghavendra et al., 2016). examined how two distinct yoga styles affected asthma patients' ability to breathe , while another study examined the advantages of ujjayi yoga in conjunction with diaphragmatic breathing exercises for asthma (Bahçecioğlu Turan & Tan, 2020; Hussein et al., 2016; Pandit & Vaidya, 2013). The FEV1 and FVC values of the yoga group were found to have significantly improved when compared to the control group. In contrast to the ayurvedic and control groups, the yoga group's FEV1 and FVC values dramatically rose, per a study evaluating the benefits of yoga and ayurveda applications on asthma patients (Jerath, 2016; Sewa & Ong, 2014). Yoga has been found in numerous studies to increase PEFR values (Fukuoka et al., 2016; Satyanand et al., 2014). However, this study found no appreciable difference in the PEFR levels of the

groups. It should be noted that there is not always a correlation between PFT values and asthma symptoms, and that PFT measurements may not be sufficient in diagnosing asthma (Anshu et al., 2023; Li et al., 2020). According to study showing yoga had positive effects on PFT and PEF levels, the application duration was at least two months and might extend up to a year. Conflicting results for PFT and PEF values in this inquiry may have been caused by the short study time.

Prior to the administration of treatment, it was discovered that the aerobic and yoga groups' AQLQ ratings were extremely low across all subscales. Following the implementation of the treatment, both groups' AQLQ ratings climbed noticeably, with the yoga group outperforming the aerobic group on every subscale. The findings of earlier research showing increases in asthma patients' quality of life following yoga are corroborated by this study (Carranza Rosenzweig et al., 2004; Kligler et al., 2011; M. et al., 2019; Vempati et al., 2009). After treatment, the yoga group's overall AQLQ score, symptoms, activity limitation, and emotional function subscale scores significantly improved compared to the control group. In their study examining the impact of a yoga-based lifestyle on asthma management, they found that the yoga group had higher AQLQ scores for all subscales except environmental stressors (Kligler et al., 2011; M. et al., 2019; Swathi et al., 2021). revealed that in the study assessing the effects of Buteyko and yoga, the yoga group's AQLQ overall, symptom, and activity limitation subscale scores significantly rose when compared to the control group (Murthy et al., 2017; Swathi et al., 2021).

## Strengths and limitations

In order to determine if the positive benefits of yoga's application last, the study recommends expanding its clinical usage as part of rehabilitation in the treatment of asthma symptoms and carrying out long-term observation studies. Repetitive interviews and the inclusion of more patients in the study were not possible since some of the patients who fulfilled the study's inclusion criteria resided distant from the physiology lab at Universitas Negeri Yogyakarta. Furthermore, it was challenging for the patients to stick to the program and extend the application period because they had to maintain the application every day. Furthermore, the patients' erroneous preconceived notions about yoga led them to view the practice's effects and content with suspicion. Additional study limitations include patients who kept using the applications at home after the training was finished and some patients who cut back on their medication dosages without talking to their physicians or researchers after their asthma symptoms subsided.

## Conclusions

Asthma patients who practiced yoga for 45 minutes, three days a week, for three months saw improvements in their quality of life and asthma management; PFT readings were not significantly affected. To assess the longer-term impacts of such activities, more research should be scheduled for more than three months.

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