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Effects of Physical Activity on Asthma Patients – A Literature Review

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ABSTRACT

Introduction. Asthma is a heterogeneous chronic respiratory disease characterized by chronic airway inflammation and variable airflow limitation. Historically, patients were discouraged from engaging in physical activity (PA) due to the prevalence of Exercise-Induced Bronchoconstriction (EIB). However, emerging evidence suggests that sedentary behavior and obesity are significant contributors to poor disease control and diminished quality of life in asthmatic populations.

Aim. This review aims to evaluate the relationship between regular physical activity and asthma pathophysiology, specifically assessing how exercise influences clinical outcomes.

Methods. A systematic review of current literature was conducted, focusing on original research, as well as systematic reviews and meta-analyses that measure the physiological response to aerobic and resistance training in asthma patients.

Results. The review indicates that regular physical activity is associated with improved asthma control, enhanced lung function, and a reduction in systemic inflammation. Despite these benefits, a significant gap remains in the literature regarding the dose-response relationship of exercise. There is currently no definitive consensus on the optimal frequency, intensity, or type of physical activity tailored to specific asthma phenotypes.

Conclusion. Physical activity is a vital component of asthma management that counteracts the risks associated with a sedentary lifestyle. While the physiological benefits are evident, further research is required to establish standardized exercise prescriptions to maximize therapeutic outcomes for all patients.

Keywords: asthma, physical activity, exercise-induced bronchoconstriction, obesity

Content

1. Introduction 5
2. Research materials and methods 6
2.1 AI 6
3. Research results 6
3.1. Clinical Effects of Physical Activity on Asthma 6
3.2. Management of the Obesity-Asthma Phenotype 8
3.3. The Barrier: Exercise-Induced Bronchoconstriction (EIB) 8
3.4. Different types of PE 9
4. Conclusions 11
Disclossure 12
Authors' Contributions: Conceptualization: Aleksandra Marchwińska-Pancer 12
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Check: Aleksandra Marchwińska-Pancer, Paweł Michalak 12
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The authors confirm that the data supporting this study are available in the article's references 12
Conflicts of Interest 12
The authors declare no conflict of interest. 12
References 13

1. Introduction

Asthma is a heterogeneous chronic respiratory disease primarily characterized by airway inflammation and variable expiratory airflow limitation. Clinically, it manifests as fluctuating symptoms of wheezing, dyspnea, chest tightness, and cough. [1]

While pharmacotherapy remains the cornerstone of management, clinical focus has shifted toward identifying and addressing potentially modifiable factors to improve long-term outcomes. [2]

Physical inactivity is increasingly recognized as a critical treatable trait in asthma care. It serves as a key modifiable risk factor that directly impacts respiratory function, disease control, and mental well-being. [3,4]

Unfortunately, some studies show that patients with asthma are less likely to engage in physical activity. [5] Observational evidence suggests that avoidance behavior, stemmed from a fear of exercise-induced bronchoconstriction, significantly contributes to this sedentary trend. [6] This avoidance creates a vicious cycle of deconditioning: reduced aerobic capacity leads to exertional dyspnea at lower thresholds, which patients often misinterpret as worsening asthma control, potentially leading to inappropriate escalation of pharmacotherapy. [7] Specifically, the reduction in energy expenditure contributes to the rising prevalence of obesity among asthmatics, a comorbidity now understood to induce a unique, often severe, obese asthma phenotype characterized by systemic inflammation and resistance to standard corticosteroid therapy. [8]

Regular exertion is hypothesized to shift the inflammatory profile from a pro-inflammatory state toward a regulatory phenotype. This occurs not only through the reduction of adiposity but also via the release of skeletal muscle-derived myokines, such as Interleukin-6 (IL-6), which exerts direct anti-inflammatory effects in the systemic circulation. [9] Consequently, physical activity holds the potential to address the systemic component of asthma that pharmacotherapy alone often fails to target, particularly in non-type 2 or obese phenotypes. [10]

Despite the biological plausibility of exercise as a therapeutic adjunct, the translation of this knowledge into precise clinical prescription remains elusive. While guidelines broadly encourage an active lifestyle, current clinical practice lacks defined exercise prescription protocols for asthma, especially for the severe phenotype.

2. Research materials and methods

To review the literature on the topic of the effects of physical activity on asthma patients, PubMed, Cochrane Library, and Google Scholar were searched using the following keywords: asthma, physical activity, sport, obesity, exercise-induced bronchoconstriction. Articles published between 2000-2025 were selected. Preference was given to English-language peer-reviewed original research, as well as systematic reviews and meta-analyses.

2.1 AI

AI was utilized for two specific purposes in this research. Text analysis of clinical reasoning narratives to identify linguistic patterns associated with specific logical fallacies. Assistance in refining the academic English language of the manuscript, ensuring clarity, consistency, and adherence to scientific writing standards. Gemini was used for additional linguistic refinement of the research manuscript, ensuring proper English grammar, style, and clarity in the presentation of results. It is important to emphasize that all AI tools were used strictly as assistive instruments under human supervision. The final interpretation of results, classification of errors, and conclusions were determined by human experts in clinical medicine and formal logic. The AI tools served primarily to enhance efficiency in data processing, pattern recognition, and linguistic refinement, rather than replacing human judgment in the analytical process.

3. Research results

3.1. Clinical Effects of Physical Activity on Asthma

The most consistently reported benefit of regular physical activity (PA) in asthmatic populations is the substantial improvement in patient-reported outcomes. Multiple randomized controlled trials indicate that aerobic training programs significantly improve scores on the Asthma Control Test (ACT) and the Asthma Quality of Life Questionnaire (AQLQ). [9,11,12,13] These improvements are attributed not only to the physiological adaptations discussed below but also to psychological factors; regular exertion builds self-efficacy, improves sleep quality and reduces the anxiety associated with breathlessness. Moreover, Endrigue etc. demonstrated a distinct trend regarding patient responsiveness to PA intervention. They suggested that "better responders" were characterized by worse baseline clinical control, lower quality of life, and lower physical capacity, implying a lower ceiling for improvement is not a prerequisite for benefit. [14]

A critical distinction in the literature is the disconnect between cardiorespiratory fitness and resting lung function. While exercise training consistently increases maximal oxygen uptake (VO2max) and the anaerobic threshold, the results in significant changes to resting airway caliber (measured as FEV1) or bronchial hyperresponsiveness differ. Several systematic reviews report post-intervention gains in lung function, characterized by improvements in FEV1, FEF25%–75%, FVC. [15,16] Specifically, Hansen et al. (2020) noted a slight increase in FEV1 associated with exercise training. [17] In contrast, a 2013 meta-analysis yielded no statistically significant improvements in objective pulmonary parameters. This suggests that the perceived reduction in dyspnea may be secondary to enhanced cardiovascular efficiency and peripheral oxygen utilization rather than a fundamental alteration in airway geometry or resting lung mechanics. [18]

Beyond mechanics, the anti-inflammatory potential of physical activity is an emerging area of clinical interest. Regular moderate-intensity exercise acts as an immunomodulator, potentially reducing systemic inflammation markers such as C-reactive protein (CRP) and Interleukin-6 (IL-6). [19] While the effect on airway-specific inflammation (FeNO) remains a subject of debate, recent evidence suggests that aerobic training can lead to a significant "corticosteroid-sparing" effect. For instance, Pitzner-Fabricius et al. (2023) demonstrated that six months of high-intensity interval training (HIIT) allowed for a 24% reduction in daily inhaled corticosteroid (ICS) dose without compromising asthma control. [20]

Further meta-analytic evidence indicates that exercise-based pulmonary rehabilitation enhances functional capacity, specifically increasing 6-minute walk distance and maximum oxygen uptake. [21]

The impact of physical activity on the frequency of severe asthma exacerbations is increasingly recognized as protective. Robust longitudinal evidence consistently demonstrates that higher baseline physical activity levels are associated with a significant reduction in the risk of exacerbations and hospitalizations. [4,22] Complementing these observational findings, interventional studies consistently validate the safety of exercise training, confirming that it does not induce acute respiratory events or clinical instability when appropriate protocols are followed. Consequently, the prevailing consensus supports exercise not merely as safe, but as a stabilizing adjunct therapy capable of reducing the burden of acute episodes in moderate-to-severe patients. [23,24]

3.2. Management of the Obesity-Asthma Phenotype

Physical activity is particularly critical in managing the obesity-asthma phenotype, a distinct clinical subgroup characterized by increased severity, frequent exacerbations, and a poor response to standard inhaled corticosteroids (ICS). [25] Large-scale cluster analyses have identified a specific obese asthma phenotype that is distinct from traditional allergic asthma. This cluster is typically characterized by late-onset symptoms, a high body mass index (BMI), and an absence of eosinophilic airway inflammation, meaning these patients experience significant respiratory distress despite having low levels of eosinophilic airway inflammation. [26]

Recent evidence published in The Journal of Allergy and Clinical Immunology: In Practice (2023) emphasizes that weight loss of as little as 5–10% is sufficient to achieve clinically meaningful changes in asthma symptoms and rescue inhaler use. [27] Importantly, the addition of structured exercise to dietary interventions has been shown to be superior to diet alone. While dietary restriction is the primary driver of weight loss, exercise specifically improves maximal ventilatory efficacy and reduces systemic pro-inflammatory biomarkers like Interleukin-6 (IL-6), which are typically elevated in obese patients. [27, 28]

Consequently, for the obese-asthma cluster, physical activity should be viewed not merely as a lifestyle adjunct but as a targeted physiological intervention. By enhancing ventilatory efficiency and decoupling the mechanical burden of obesity from the patient's perceived respiratory effort, regular exercise addresses the functional deficits that remain unresponsive to traditional pharmacological escalations.

3.3. The Barrier: Exercise-Induced Bronchoconstriction (EIB)

Exercise-Induced Bronchoconstriction (EIB) represents the primary physiological barrier to physical activity for the asthmatic patient. Defined as a transient narrowing of the airways that occurs during or after vigorous exertion, EIB is highly prevalent, some studies suggest it’s affecting up to 90% of patients with symptomatic asthma. [29] The mechanism is widely accepted to be osmotic and thermal in nature: the high ventilatory demand during exercise leads to evaporative water loss from the airway surface liquid. This dehydration creates an osmotic gradient that triggers the release of inflammatory mediators (histamine, cysteinyl leukotrienes, and prostaglandins) from mast cells and eosinophils, resulting in smooth muscle contraction. [30] In the context of comorbid EIB and chronic asthma, the pathophysiology serves merely to exacerbate the intrinsic airway hyperresponsiveness linked to suboptimal asthma management. [31]

A clinically important phenomenon in EIB is the "refractory period." Evidence suggests that for many patients, a second bout of exercise performed within 60 minutes of the first results in significantly less bronchoconstriction. This observation underpins the consensus recommendation for a structured warm-up protocol. Research indicates that performing interval-based warm-ups (e.g., short bursts of high intensity) can induce this refractory state, effectively pre-conditioning the airways and reducing the severity of bronchospasm during the subsequent main training session. [32]

While pharmacological prophylaxis using Short-Acting Beta-Agonists (SABA) remains the first-line acute strategy, over-reliance on SABAs without addressing underlying inflammation is discouraged. Current guidelines emphasize that optimal control of baseline inflammation with Inhaled Corticosteroids is the most effective method to dampen the severity of EIB. [33] Furthermore, longitudinal evidence suggests a desensitization effect: regular exercise training decreases minute ventilation for a given work rate, thereby reducing the osmotic stress on the airways and raising the threshold at which EIB occurs. Thus, while exercise is the trigger, consistent training serves as the long-term physiologic treatment. [16]

3.4. Different types of PE

Despite the biological plausibility of exercise as a therapeutic adjunct, the translation of this knowledge into precise clinical prescription remains elusive. Unlike pharmacological agents, where dosages are standardized, exercise is often prescribed vaguely. Current clinical practice lacks a universally validated protocol specifically for asthma, especially for severe phenotypes.

A Cochrane Review by Beggs et al. supports swimming as an excellent option for increasing fitness with low asthmogenic risk. [34] However, chlorinated pools pose a distinct risk. Exposure to trichloramine (a chlorine byproduct) can damage the airway epithelium. Lomax (2016) highlights that for sensitized individuals, indoor swimming may paradoxically increase airway hyperresponsiveness. [35] Therefore, swimming is highly recommended physiologically, but environmental caution is required.

Continuous rhythmic exercise (walking, cycling, jogging) remains the cornerstone of asthma rehabilitation. Its primary outcome is the enhancement of cardiorespiratory fitness and the reduction of systemic inflammation. A head-to-head trial by Evaristo et al. (2020) compared aerobic training directly against breathing exercises. While both improved symptoms, the aerobic group was 2.6 times more likely to achieve clinically significant asthma control and showed a greater reduction in rescue medication use. [11] This suggests that systemic physiological conditioning confers superior clinical stability compared to respiratory retraining alone. Different study showed that aerobic exercise improved asthma control and lung function while it had no apparent effect on markers of airway inflammation. [17]

Often overlooked, resistance (strength) training may be vital for addressing the peripheral muscle dysfunction often caused by inactivity or chronic corticosteroid use. In the first controlled trial published this year, the results showed that adding strength training to endurance training and education does not seem to result in further improvement in the quality of life of individuals with moderate-to-severe asthma. [36] The authors also emphasized that the observed improvement in peripheral muscle strength in participants could be a valuable addition to pulmonary rehabilitation programs.

Historically avoided due to fear of heavy breathing, HIIT is emerging as a time-efficient alternative. Toennesen et al. (2018) and Silva et al. (2022) [23,37] have demonstrated that HIIT is well-tolerated in asthmatics. The intermittent nature of the protocol may prevent the cumulative drying of airways that triggers bronchospasm. Silva's study notably found that HIIT was superior to continuous moderate exercise in reducing dyspnea scores and lower limb fatigue, making it a viable option for patients with high symptom burdens.

Another suggested form of exercise is breathing exercise. Techniques such as the Buteyko method, Papworth method, or Yoga (pranayama) focus on retraining breathing patterns (e.g., reducing hyperventilation). While Santino et al. confirm that these exercises improve Quality of Life and reduce anxiety, they do not improve physiological fitness or reduce airway inflammation. [38] Therefore, they should be prescribed as a psychological adjunct to manage symptoms/panic, rather than a replacement for active physical training.

This variability in physiological outcomes was recently contextualized by Liu et al. (2025) [39] in an overview of systematic reviews. While their synthesis confirmed the broad efficacy of physical activity in improving lung function and quality of life, they noted that the certainty of evidence remains constrained by methodological flaws and heterogeneity across primary studies. Consequently, they emphasize that high-quality, standardized trials are urgently required to bridge the gap between general effectiveness and precise, phenotype-specific clinical prescriptions.

4. Conclusions

The management of asthma has historically focused almost exclusively on the pharmacological suppression of airway inflammation. However, the evidence synthesized in this review highlights that physical inactivity is a critical, independent risk factor that drives disease progression, systemic inflammation, and the obese-asthma phenotype. While pharmacological therapy remains the cornerstone of acute symptom management, it often fails to address the systemic and psychophysical components of the disease—gaps that physical activity is uniquely positioned to fill.

Current literature resolves several historical paradoxes that have hindered the prescription of exercise. First, while exercise is a known trigger for bronchoconstriction, regular training induces a refractory state and raises the threshold for symptoms, effectively acting as a physiologic desensitizer. Second, although aerobic conditioning may not significantly alter resting lung mechanics, it robustly improves patient-centered outcomes including quality of life, dyspnea scores, and exercise tolerance by enhancing peripheral muscle efficiency and reducing the ventilatory requirement for daily tasks. Crucially, contemporary data confirms that exercise training, even at high intensities or in severe populations, is safe and does not increase the risk of exacerbations when appropriate pre-exercise protocols are followed.

Despite positive trends in clinical outcomes, the certainty of evidence remains compromised by methodological limitations and high risk of bias in primary studies. Consequently, there is an imperative need for robust, large-scale trials that not only confirm efficacy but also establish precise, personalized intervention protocols to optimize clinical results.

Disclossure

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