

## Short Notes

# Aerobic Interval Training: an Alternative for Targeting Inflammation in Chronic Obstructive Pulmonary Disease?

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**Abstract**

Chronic obstructive pulmonary disease (COPD) is a persistent inflammatory lung condition characterized by damage to the lung parenchyma and airway inflammation. Systemic inflammation is also a hallmark of COPD, and elevated levels of inflammatory markers like IL-8 and TNF- $\alpha$  are associated with disease severity and exacerbations. As the current pharmacological treatments of COPD focus on symptom management rather than inflammation, it is crucial to explore the attenuation of inflammation offered by non-pharmacological interventions. Pulmonary rehabilitation (PR) a holistic approach including education, exercise, and support is the main non-pharmacological treatment for COPD at the moment. However, its impact on inflammation remains unclear. Research indicates that PR programs including both continuous and interval training improve functional outcomes in COPD, yet their effects on inflammatory markers like IL-8 and TNF- $\alpha$  are largely unexplored. To address this gap, we aim to gauge the effects of high-intensity interval training and moderate-intensity continuous training on IL-8 and TNF- $\alpha$  levels in COPD patients. Participants will undergo PR programs with different exercise regimens, while a control group will also be monitored. Our aim is to determine which exercise modality better reduces inflammation in COPD patients, potentially offering insights into more effective treatment approaches.

**INTRODUCTION**

Chronic obstructive pulmonary disease (COPD) is a chronic inflammatory lung disease characterized by the destruction of lung parenchyma [1]. Inflammation, affecting the lung parenchyma and airways, is pivotal in developing COPD, as studies have shown positive associations between lung inflammation and COPD exacerbations [2]. Furthermore, COPD is marked by systemic inflammation, with elevated levels of IL-8 and TNF- $\alpha$  being key features [3]. IL-8, primarily secreted by airway epithelial cells, correlates positively with inflammation severity and COPD exacerbations [4], and negatively with treatment response rates [5]. In addition, TNF- $\alpha$ , secreted by lung inflammation-involved macrophages, is associated with severe stages of COPD [6]. Moreover, both IL-8 and TNF- $\alpha$  levels increase during exacerbations in severe COPD cases [3].

While inflammation is the underlying foundation of COPD, first-line pharmacological treatments are not targeted at

downregulating this response, and instead focus on alleviating the symptoms. Inflammation is targeted as a last resort due to the heterogeneity of inhaled corticosteroids for COPD patients, as well as the adverse events they will bring about in the long term [7]. Considering this, non-pharmacological interventions like pulmonary rehabilitation might offer a more effective approach in targeting the inflammatory aspect of the pathology.

Pulmonary rehabilitation (PR), a combination of education, dietary supplementation, psychological support, and exercise training, is regarded as a pillar in treating COPD [8]. It has been reported to increase quality of life and aerobic exercise capacity while simultaneously reducing dyspnea [9]; however, its effects on inflammation are not fully understood yet [10]. Exercise training is a central component of PR programs [8], and, as a result, investigations have been conducted into the efficacy of incorporating different types of exercises into PR.

The literature has extensively examined two exercise

modalities: continuous and interval training. As a result, numerous systematic reviews have been conducted, showcasing the comparable effectiveness of interval training to continuous training in terms of functional outcomes like peak oxygen uptake, peak power, and 6-minute walk test distance [11,12]. However, the change in underlying pathophysiological markers such as cytokine levels, have been largely unexplored in COPD patients. In healthy subjects, it has been demonstrated that interval training and continuous training significantly reduce IL-8 levels [13], and that interval training reduces the levels of TNF- $\alpha$  [14]. Yet, no specific study has investigated the effect of exercise training types on the levels of IL-8 and TNF- $\alpha$  in COPD patients to date. To bridge this gap in the literature, the authors set out to conduct a study on the effect of high-intensity interval training, and moderate-intensity continuous training on the levels of IL-8 and TNF- $\alpha$  in COPD patients at Masih Daneshvari Hospital. The study will consist of three groups: two groups will participate in PR programs incorporating one of the mentioned modes of exercise training, while the third group will serve as the control. The levels of IL-8 and TNF- $\alpha$  will be compared amongst groups as proxies for their ability in order to reduce inflammation after two weeks of training.

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