



## Editorial

# Exercise Benefits for Chronic Obstructive Pulmonary Disease Patients



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Chronic obstructive pulmonary disease (COPD) has caused large social and economic burden worldwide, and various morbidities for COPD are gradually increasing with the trend of younger age at the time of diagnosis. Although significant progress has been made in preventing and treating COPD, novel methods are needed urgently to improve the habilitation of patients. Despite the various combinations of drugs used to relieve the symptoms of COPD patients, there has been significant interest in changing the behavior of patients to improve their prognosis. For example, smoking cessation is the most effective approach to slow down the progression of pulmonary function impairments. In addition, the benefits of exercise programs and interventions are widely recognized for all age groups, and in patients with stable heart failure.<sup>1</sup> For the issue of Exploratory Research and Hypothesis in Medicine, Petros *et al.* published the study, “Effective of Exercise on Respiratory Drive in Chronic Obstructive Pulmonary Disease Patients: A Systematic Review and Meta-Analysis”.<sup>2</sup> The authors of this study indicated that eight weeks of respiratory muscle training can reduce the dyspnea intensity and improve exercise tolerance, and it was revealed that intense exercise is correlated to the percentage of maximum diaphragm electromyogram (EMGdi%max) and dyspnea intensity. In particular, EMGdi%max is an important index for indicating dyspnea severity, and reduced ventilatory and neuromuscular efficiency. Petros *et al.* suggested a novel mechanism, in which exercise may benefit COPD patients, and pointed out the significance of EMGdi%max.

Major databases were searched by Petro *et al.*, and a meta-analysis was performed after rigorous data screening. Comprehensive and accurate information collection is of vital importance to ensure the accuracy of research results. The different effects of diverse types of training were also analyzed in that study, for the research to be more practical. However, several limitations were mentioned in that study. These mainly referred to the small sample size, and it was noted that exercise intervention details should have been provided. In addition,

a table for cycle and treadmill exercise improvement on statistically significant EMGdi%max outcomes is necessary. Finally, the risk of bias assessment results was fully exhibited.

Exercise intolerance is one of the major symptoms of COPD. In order to address this problem, studies have revealed that exercise training can improve the exercise capacity and physical symptoms, and significantly improve the quality of life of COPD patients.<sup>3</sup> Therefore, moderate exercise is necessary for the overwhelming majority of COPD patients. Pulmonary rehabilitation programs (PRPs), including whole-body exercise training, can improve symptoms, exercise capacity and health-related quality of life (HRQL), and these are recommended for all stages of COPD. As a beneficial effect of inspiratory muscle training (IMT) on dyspnea, the strength and endurance of inspiratory muscles, and exercise capacity in the 6 minute walk test were also suggested by the European Respiratory Society (ERS) consensus. Meanwhile, the American Thoracic Society (ATS) and ERS noted that pulmonary rehabilitation is presently recognized as a core component in the management of patients with COPD, and that health behavior change is vital for the optimization and maintenance of benefits, from any intervention in chronic care.<sup>4</sup> This study further verified the advantages and benefits of IMT. Petros *et al.* also noted that intense exercise can induce a higher EMGdi%max, and improve the respiratory drive, which would be helpful for COPD patients. In addition, this study provided more favorable evidence on the practical application of the EMGdi%max index. Thus, the underlying indicator, EMGdi%max, was addressed, and it was noted that measuring the EMGdi%max during exercise can be a useful clinical tool, due to its relevance to dyspnea severity and sensitivity to exercise interventions. More in-depth studies on this index should be carried out.

Interestingly, exercise can benefit COPD patients from all aspects, according to various studies. Exercise can improve cognitive performance in elderly patients with COPD through multiple pathways, such as improving oxidative stress, systemic inflammation, cerebrovascular function, and anxiety and depression.<sup>5</sup> Furthermore, exercise training has been shown to decrease the age-associated inflammatory status, and improve T cell immune responses, contributing to more efficient immunity against infections in COPD patients.<sup>6</sup> These studies on molecular mechanism illustrate some of the reasons why physical activities benefit COPD patients. Meanwhile, an increasing body of clinical research suggests that proper physical exercise can delay the progression of COPD, and improve the life quality of these patients. However, the underlying mechanism, by which exercise training can benefit COPD patients, remains unclear.

**Abbreviations:** COPD, chronic obstructive pulmonary disease; ERS, European Respiratory Society; HRQL, health-related quality of life; PRPs, Pulmonary rehabilitation programs; EMGdi%max, percentage of maximum diaphragm electromyogram.

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In summary, the research described in the present study noted the novel effect of exercise on COPD patients. The meta-analysis of 12 studies revealed that exercise can improve the respiratory drive, which is represented by EMGdi%max. It is noteworthy that these findings provide an underlying indicator for guiding COPD patients providing better rehabilitation, and further research. However, due to the limited number of applicable studies and the heterogeneity among these researches, large-scale randomized controlled trials for patients with COPD are needed.

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### Conflict of interest

The authors declare no conflict of interest.

### Author contributions

The manuscript was written by XZ, and the literature review and

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