

# Recommendation of physical activity for patients with severe COPD: an integrative review

## Abstract

**Introduction:** Chronic obstructive pulmonary disease (COPD) is characterized by irreversible but treatable airflow obstruction, and it is estimated that 210 million people suffer from the disease.

**Objectives:** To describe the main benefits of high-intensity physical training within pulmonary rehabilitation programs for patients with severe COPD.

**Methods:** An integrative review of the scientific literature involving only randomized clinical studies that applied high-intensity physical training to patients diagnosed with moderate to severe COPD, available in full and published between 2015 and 2020.

**Conclusion:** After a critical and careful reading of the mentioned articles, the authors of this research recommend the use of moderate to high intensity physical activity even for patients with moderate to severe COPD, as long as physical criteria are rigorously evaluated and the team is properly prepared to perform the tasks. physical modalities suggested here.

**Keywords:** severe chronic obstructive pulmonary disease, pulmonary rehabilitation, physical training

Volume 5 Issue 5 - 2020

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**Received:** August 15, 2020 | **Published:** September 03, 2020

## Introduction

Chronic obstructive pulmonary disease (COPD) is considered the most frequent chronic disease, being the third leading cause of death in the US and the fourth worldwide.<sup>1</sup> Among the physiological changes expected for the disease are: airway limitations, limb muscle dysfunction, reduction in muscle oxidative capacity and less tolerance to exercise.<sup>2</sup>

Pulmonary rehabilitation programs are part of the gold standard in the treatment of COPD, in this strategy are important: medical follow-up, engagement in physical activity and habit changes by patients. Among the objectives of these programs are to reduce symptoms, increase exercise tolerance, and increase functional capacity.<sup>3</sup>

Despite the numerous proven benefits on the effectiveness of rehabilitation programs for patients with COPD, approximately 50% of them refuse to participate and about 30-50% leave the program before its conclusion.<sup>4</sup> The aim of this study was to describe the main benefits achieved by including high-intensity physical training in pulmonary rehabilitation programs for patients with severe COPD.

## Methods

It is an integrative review of the literature, a method that allows

the survey and analysis of subsidies present in scientific literature, in a broad and systematic way. It is a method that aims to synthesize results obtained from research on a theme or issue, in an orderly and comprehensive manner.<sup>5</sup>

The elaboration of this study had six stages: (1) definition of the problem; (2) database search in virtual libraries (Pub Med, Virtual Health Library - Bireme, Scielo) by means of descriptors in Portuguese and their correspondents in English; (3) individual reading of texts pertinent to randomized clinical studies, with complete methodologies for critical analysis in relation to their adherence to the objective of this research; (4) tabulation of the main findings of selected studies; (5) interpretation of results and; (6) synthesis of knowledge.

This study included only articles of the randomized clinical trial type, published between 2015 and 2020, that approached patients with moderate to severe COPD and that were available in full on the search platforms surveyed. The descriptors severe COPD, pulmonary rehabilitation and physical exercise were used for the Portuguese and English languages. Among the exclusion criteria were: review articles, publication of protocols, articles not published between 2015 and 2020, works that were not related to the subject of this research, that were not available in full, or that did not clearly describe their methods (Figure 1).

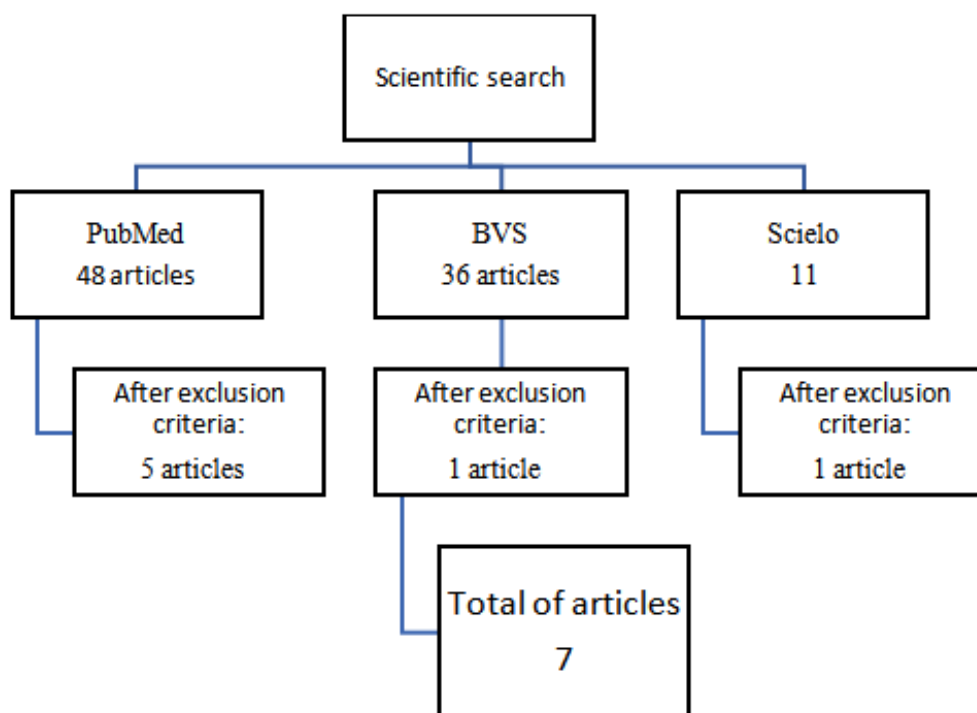


Figure 1 Research flowchart.

**Results** (Table 1)

Table 1 Brief description of studies and their most relevant results in prescribing physical activity for the severe COPD patient

Author/year	Methods	Main results
He et al. <sup>3</sup>	203 patients with moderate to severe COPD were submitted to 20 weeks of light, moderate and high intensity training with exercise bike and resistance training for upper and lower limbs	Critically ill patients submitted to medium and high intensity exercise programs showed improvement in FEV <sub>1</sub> , FEV <sub>1</sub> %, BODE index and 6MWT'
Bourne et al. <sup>19</sup>	90 patients with severe COPD were treated virtually (n=64) and in person (n=26) through an exercise program, for 6 weeks	There were similar gains among the groups for increased travel distance at the 6MWT', reduced symptoms and improved quality of life.
Franke et al. <sup>9</sup>	44 patients diagnosed with moderate to very severe COPD participated in aerobic training with ergo metric bicycle at home for 20 minutes over 6 months	Patients showed improvement in exercise tolerance and in the indexes that measure quality of life
Santos et al. <sup>11</sup>	34 patients with moderate to severe COPD participated in a program of aerobic, resisted and flexible exercises, from moderate to high intensity, at a frequency of 3x/week, during 20 sessions	Both groups showed an increase in the distance travelled on the 6MWT', a reduction in dyspnea and an improvement in quality of life
Burtin et al. <sup>12</sup>	50 patients with moderate to severe COPD received high to moderate intensity exercise sessions, 3x/week for 3 months and 2x/week for the following 3 months	Increased distance travelled on the 6MWT' and improved quality of life were observed
Evans et al. <sup>13</sup>	22 patients with severe and very severe COPD were submitted to 6 and 8 weeks of aerobic training on bicycle, cycling with only one of the legs for 15 min in separate sessions and load increments to each session	There was an increase in the distance traveled at the 6MWT', a lower volume of O <sub>2</sub> consumed, an improvement in symptoms and quality of life
De Albuquerque et al. <sup>6</sup>	22 patients with moderate to very severe COPD were submitted to 8 weeks of training for upper and lower limbs, associated with walking, in a supervised and unsupervised manner	16 patients had increased distance travelled at the 6MWT', reduced consumption and O <sub>2</sub> and CO <sub>2</sub> exhalation during exercise

## Discussion

Pulmonary rehabilitation is one of the most effective interventions in COPD management and produces significant improvements in exercise performance, with reduction of shortness of breath in patients with different degrees of severity of the disease.<sup>6</sup> The inclusion of these patients in physical activity programs has strong scientific evidence on the improvement of functional capacity, dyspnea and indices that measure quality of life, above any other therapy instituted.<sup>7</sup> In advanced COPD it is common to lose type I muscle fibers and oxidative enzymes, which can affect muscle performance and exercise tolerance but also justify the application of resistance training to upper and lower limbs as a way to prevent and/or avoid this loss.<sup>2</sup>

However, exercise intolerance is one of the main causes of non-adherence to rehabilitation programs, and the main factors for this are: dyspnea, peripheral muscle loss, easy fatigue and lack of motivation.<sup>8</sup> Even so, patients with severe COPD should be encouraged to exercise, since higher levels of physical activity are related to fewer hospitalizations, lower costs of treating the disease and less deaths.<sup>9</sup>

It is known that cardiovascular exercises applied in pulmonary rehabilitation programs are capable of increasing the distance walked; improving cardiopulmonary performance and increasing the oxygen consumed in the peripheral muscles,<sup>10</sup> and although the evidence is still scarce, moderate to high-intensity training seems to present better results on lung capacity when compared to low intensity training.<sup>11</sup>

This seems to have been evident in the work of Felcar et al.<sup>14</sup> who applied moderate to high intensity training among patients treated in the aquatic environment and environment, and both groups presented an increase in the number of steps per day, improvement in maximum inspiratory and expiratory pressure levels, increase in maximum and sub-maximum functional capacity and quality of life scores. For Nici et al.<sup>8</sup> exercises that use more than 60% of the training heart rate and involve high intensity exercises for upper and lower limbs, also present more expressive results on pulmonary function.

Zambom-Ferraresi et al.<sup>15</sup> in turn, compared 12 weeks of resistance training versus combined training (resistance associated to endurance) with a control group, for a sample of 36 patients with moderate to severe COPD and observed increased functional capacity, improved performance of the 6-minute walk test (6MWT<sup>7</sup>) and increased strength of the peripheral muscles of upper and lower limbs. For He et al.<sup>3</sup> low intensity exercises do not seem to generate satisfactory effects in severe patients even after 20 weeks of training.

Paneroni et al.<sup>16</sup> also performed a meta-analysis of studies with patients with only 35% FEV<sub>1</sub> and concluded that physical exercise was able to improve exercise tolerance and quality of life. McKeough et al.<sup>17</sup> observed that patients who underwent upper limb training showed significant improvement in the degree of dyspnea when compared to those who did not. Camillo et al.<sup>18</sup> in turn, evaluated 333 patients undergoing 6 months of aerobic and resistance training for high-intensity for upper and lower limbs and observed increased muscle strength, improved performance of the 6MWT<sup>7</sup> and incremental test of functional capacity, as well as improved quality of life indices. For the authors, 350m values at the 6MWT<sup>7</sup> were associated with higher mortality risk.

There is no consensus in the literature for frequency of a rehabilitation program, however, most studies have pointed out

that 7-week training is more effective than 4-week training and 20 sessions provide greater benefits than the traditional 10 sessions. High intensity training is considered to be that which exceeds 60% of the peak physical capacity and whose dyspnea on the Borg scale is between 4 and 6. In the case of resistance training for upper limbs, a load between 50-85% of 1 MR (maximum repetition) is capable of promoting more satisfactory physiological effects than lighter loads.<sup>8</sup>

Langer et al.<sup>19</sup> in turn, recommended that an adequate training should present 40-60% of the reserve heart rate, 60-80% of 1 MR and dyspnea on the Borg scale of 5 to 6. Miki et al.<sup>20</sup> conducted the aerobic training of 36 patients with resistance from 60 to 80% of peak oxygen consumption obtained in cycloergometer test. During He et al.<sup>3</sup>'s research, the institution of aerobic training in stationary bicycle considered values  $\geq 70\%$  of peak oxygen consumption as high intensity, values of 50 – 70% were classified as moderate intensity and values < 50% characterized as low intensity.

It is known that the institution of adequate treatment within the rehabilitation programs is the responsibility of a multidisciplinary team, in this sense, the authors who used the training proposals of high to moderate intensity and were mentioned in this work adopted as exclusion criteria: exacerbation in the last 3 months, more than one hospital stay in the last 12 months or, more than two emergency visits, absence of routine use of inhaled bronchodilator and corticosteroid, absence of short-term steroid prescription, presence of major cardiovascular impairment, presence of hypertension uncontrolled and oxygen saturation less than 88% during the performance of the proposed exercises.<sup>1,3,19,21</sup>

We know that pulmonary rehabilitation programs are part of the gold standard in the management of COPD, however, many patients are unable to access these programs, so exercise strategies to be carried out at home arise with strong social appeal especially for patients who live far from the places where the programs take place.<sup>22,23</sup> In this sense also, the institution of exercises through videogames has proven to be an effective alternative for treatment compliance and observance in increasing physical capacity, greater exercise tolerance, longer distances traveled on the 6MWT<sup>7</sup> and improvement in the degrees of dyspnea.<sup>7</sup>

## Acknowledgments

None.

## Conflicts of interest

No potential conflict of interest relevant to this article was reported.

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