# Acute effects of photobiomodulation therapy (PBMT) combining laser diodes, light-emitting diodes, and magnetic field in exercise capacity assessed by 6MST in patients with COPD: a crossover, randomized, and triple-blinded clinical trial

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Received: 29 January 2018 /Accepted: 18 September 2018



## Abstract

Chronic obstructive pulmonary disease (COPD) is characterized by dyspnea, as well as musculoskeletal and systemic manifestations. Photobiomodulation therapy (PBMT) with use of low-level laser therapy (LLLT) and/or light-emitting diode therapy (LEDT) is an electrophysical intervention that has been found to minimize or delay muscle fatigue. The aim of this study was to evaluate the acute effect of PBMT with combined use of lasers diodes, light-emitting diodes (LEDs), magnetic field on muscle performance, exercise tolerance, and metabolic variables during the 6-minute stepper test (6MST) in patients with COPD. Twenty-one patients with COPD ($FEV_1$ 46.3% predicted) completed the 6MST protocol over 2 weeks, with one session per week. PBMT/magnetic field or placebo (PL) was performed before each 6MST (17 sites on each lower limb, with a dose of 30 J per site, using a cluster of 12 diodes 4 × 905 nm super-pulsed laser diodes, 4 × 875 nm infrared LEDs, and 4 × 640 nm red LEDs; Multi Radiance Medical™, Solon, OH, USA). Patients were randomized into two groups before the test according to the treatment they would receive. Assessments were performed before the start of each protocol. The primary outcomes were oxygen uptake and number of steps, and the secondary outcome was perceived exertion (dyspnea and fatigue in the lower limbs). PBMT/magnetic field applied before 6MST significantly increased the number of steps during the cardiopulmonary exercise test when compared to the results with placebo (129.8 ± 10.6 vs 116.1 ± 11.5, p = 0.000). PBMT/magnetic field treatment also led to a lower score for the perception of breathlessness (3.0 [1.0–7.0] vs 4.0 [2.0–8.0], p = 0.000) and lower limb fatigue (2.0 [0.0–5.0] vs 4.0 [0.0–7.0], p = 0.001) compared to that with placebo treatment. This study showed that the combined application of PBMT and magnetic field increased the number of steps during the 6MSTand decreased the sensation of dyspnea and lower limb fatigue in patients with COPD.