

# European Respiratory Society Annual Congress 2013

**Abstract Number:** 2435  
**Publication Number:** P1332

**Abstract Group:** 9.2. Physiotherapists

**Keyword 1:** Exercise **Keyword 2:** Gas exchange **Keyword 3:** Physiology

**Title:** Acute effects of low-level laser therapy on gas exchange and electromyographic fatigue threshold during cardiopulmonary exercise testing in healthy adults

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**Body:** Despite the positive effects of low-level laser therapy (LLLT) on muscle fatigue before exercises using single muscle group, the acute effects of LLLT on performance in cardiopulmonary exercise testing (CPET) are poorly understood. We aimed to determine the effect of LLLT before CPET on gas exchange and electromyographic response in healthy adults. A randomized double-blind placebo-controlled crossover trial was performed with 18 untrained participants (9 males and 9 females;  $22 \pm 2$  yr). The LLLT or placebo was applied to quadriceps and gastrocnemius 10 min before a rapidly incremental cycle-ergometer CPET randomly performed on alternate days. The LLLT was performed using a multi-diode cluster, 20 s/site (850 nm, 100 mW/diode, 14 J/site). Physiological responses were continuously monitored during the CPETs using a gas analyzer. The electromyographic fatigue threshold (EMGth) was assessed with surface electrodes on vastus lateralis. The root mean square (RMS) was plotted every 5 s against the exercise intensity. The EMGth was visually detected as the breakpoint in RMS values throughout the CPET. Compared to placebo, the LLLT significantly increased peak  $O_2$  uptake ( $V'O_2$ :  $33 \pm 10$  vs.  $31 \pm 9$  mL/min/kg). We observed a shallower slope of the  $\Delta$ heart rate/ $\Delta VO_2$  during the CPET after LLLT compared to placebo, i.e., increased cardiovascular efficiency ( $56 \pm 24$  vs.  $66 \pm 30$  bpm/L/min). There were no LLLT-related changes in EMGth. We may conclude that the LLLT acutely increase exercise performance in healthy untrained adults primarily due to increased  $O_2$  extraction by peripheral muscles without causing significant impact on muscle fatigue.