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Title: Effect of pulmonary rehabilitation on cardiac output responses during exercise in COPD

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Body: Introduction: In patients with COPD pulmonary rehabilitation (PR) induces true physiological effects reflected by reduced ventilatory requirement and improved peripheral muscle function. The effect of PR on central hemodynamic responses during exercise remains largely unknown. Aim: To examine the impact of PR on cardiac output (Q) responses during incremental (IE) and constant-load exercise (CLE). Method: 60 COPD patients (GOLD stages II- IV) were studied (including 15 controls). PR consisted of interval cycling exercise 3 days/week for 10 weeks, with 30-s work periods/30-s rest periods for 30 min/day and intensity at 100% of peak work capacity (W_{peak}). Q was measured by bio-impedance (Physioflow PF-O7) during IE and CLE at 75% W_{peak} for 6-min during exercise and in recovery, prior to and following PR. Results: At W_{peak} there was an increase in Q after PR (from 10.1±0.5 to 12.4±0.6, L/min, p=0.001) due to increased SV (from 90±3.2 to 105.1±4.42 ml/min, p=0.003). Post-rehabilitation at an identical work rate during IE, Q did not differ compared to pre-rehabilitation; however SV was higher (pre: 90±3.2; post 95±3.2 ml/min) and HR lower (pre: 113±3; post 106±3 beats/min, p=0.008). Post-rehabilitation during CLE there were significant reductions in Q mean response time (MRT) at the onset and offset of exercise (pre: 79.8±4.4; post: 66.9±4.5sec, p=0.001) and (pre: 79.1±4.3, post: 66.1±4.2 sec, p=0.001), respectively. Conclusion: Pulmonary rehabilitation induces an improvement in central hemodynamic function to incremental and constant-load exercise in patients with COPD across GOLD stages II to IV.