Abstract Group: 4.1. Clinical physiology and Exercise
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Title: Cerebral cortex oxygen delivery and exercise limitation in patients with COPD

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Body: Background: During hypoxic exercise in healthy humans, limited frontal cerebral cortex oxygen delivery may signal the brain to cease exercise. Aim: Whether in patients with COPD experiencing exercise-induced arterial O2 desaturation, frontal cerebral cortex oxygen delivery is reduced, remains unknown. Methods: By near infrared spectroscopy, we measured both frontal cerebral cortex blood flow (CBF) using indocyanine green dye, and cerebrovascular O2 saturation (%StO2) in 12 COPD patients during constant-load exercise at 75% of peak capacity. Subjects exercised breathing air, 100% O2 or normoxic heliox, the latter two in balanced order. Results: Time to exhaustion breathing air was less than for oxygen or heliox (394±35 vs. 670±43 and 637±46 sec, respectively). In each condition, CBF increased from rest to exhaustion. At exhaustion, CBF was higher breathing air and heliox than oxygen (30.9±3.2 and 31.3±3.5 vs. 26.6±3.2 ml·min⁻¹·100g⁻¹, respectively), compensating lower arterial O2 content (CaO2) in air and heliox, and leading to similar frontal cerebral cortex oxygen delivery (air: 5.3±0.4, O2: 5.5±0.6 and heliox: 5.6±1.0 ml·O2·min⁻¹·100g⁻¹). In contrast, end-exercise %StO2 was greater breathing oxygen compared to air or heliox (67±4 vs. 57±3 and 53±3%, respectively), reflecting CaO2 rather than frontal cerebral cortex oxygen delivery. Conclusion: Prolonged time to exhaustion by oxygen and heliox despite similar cerebral cortex oxygen delivery as in air, lower %StO2 with heliox than oxygen, yet similar endurance time, and similar %StO2 on air and heliox despite greater endurance with heliox, do not support the hypothesis that cortical oxygen delivery is important in limiting exercise capacity in COPD.