Title: Unilateral neuromuscular electrical stimulation (NMES) of the quadriceps muscles in stable COPD

Body: Background: NMES may be an effective treatment of peripheral muscle weakness in COPD patients. The use of a single-leg intervention provides a control in the contralateral limb that is not confounded by variables such as nutrition or habitual activity. Aim: To determine the effects of a unilateral quadriceps NMES training programme on quadriceps maximal voluntary contraction (QMVC) and thigh lean mass (DEXA) with the untrained contralateral limb serving as a control. Method: 16 stable COPD patients [8male, mean (SD) FEV$_1$ 49.9(±22.0)% predicted, age 64.5 (±9.0) years, BMI 26.5 (±5.2) kg/m$^2$, median MRC Grade 3.5 (IQR 3-4)] completed six weeks of unilateral NMES training. The quadriceps were stimulated 5 times per week (3 supervised sessions) for 30 min at a patient selected maximum tolerable intensity. Thigh lean mass and isometric QMVC were assessed at baseline and post-training. Changes in the trained limb were statistically corrected for changes in the untrained limb. Results: Mean peak NMES training intensity progressed from 42.0 mA for the first session to a peak of 76.3 mA in week six. For the intervention limb: mean QMVC was 320.5(±97.6) N pre- and 336.7 (±84.4) N post-training; and mean thigh lean mass was 3.51(±0.78) kg pre- and 3.59(±0.75) kg post-training. When corrected for the change in the control limb, there was a statistically significant increase in QMVC +16.2(±8.2) N (p=0.002) and in thigh lean mass +83.3(±35.3) g (p=0.001) in the intervention limb. Conclusion: In stable COPD patients, six weeks of NMES training elicited small increases in quadriceps strength and thigh lean mass, which although statistically significant are of limited clinical importance.