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**Title:** Effects of high frequency airflow oscillation on breathlessness during the hypercapnic ventilatory response in healthy subjects

Dr. Caroline 7921 Jolley caroline.jolley@kcl.ac.uk MD <sup>1</sup>, Dr. Paul 7922 Sumners p\_sumners@hotmail.co.uk <sup>1</sup>, Prof. John 7923 Moxham john.moxham@nhs.net <sup>2</sup>, Dr. Gerrard 7924 Rafferty gerrard.rafferty@kcl.ac.uk <sup>2</sup> and Dr. David 7925 Green david.a.green@kcl.ac.uk <sup>1</sup>. <sup>1</sup> Centre of Human & Aerospace Physiological Sciences, King's College London, King's Health Partners, London, United Kingdom and <sup>2</sup> Division of Asthma, Allergy & Lung Biology, King's College London, King's Health Partners, London, United Kingdom .

**Body:** Introduction Chest wall vibration activates chest wall afferents and reduces breathlessness in healthy subjects (Edo et al 1998) and in COPD (Fujie et al 2002). We hypothesised that high frequency airflow oscillation (HFAO) would reduce breathlessness driven by moderate hypercapnia in healthy subjects. Methods Ventilation, diaphragm electromyogram activity (EMGdi%max), oesophageal and diaphragm pressure-time-product were recorded whilst breathing 7%CO<sub>2</sub> in air over 8 minutes. HFAO was applied during 5 consecutive breaths each minute at 0Hz, 15Hz, 30Hz and 45Hz in random order. Borg breathlessness was measured at baseline and at the end of each minute. Comparisons between HFAO frequencies were made using 1 way ANOVA with post hoc analysis using Dunn's multiple comparison test. Results 11 healthy subjects aged 20-37 years completed the study. Borg breathlessness at minute 8 was significantly lower using HFAO at 30Hz (median (IQR) Borg 2 (1 to 4)) than without HFAO (0Hz) (Borg 3 (3 to 4)), at 15Hz (Borg 3 (2 to 4)) or 45Hz (Borg 3 (2 to 4)); p = 0.004, 0Hz vs 30Hz p<0.05. No significant differences in physiological parameters recorded were observed.

**Conclusions** 30Hz HFAO reduces breathlessness in healthy subjects during a moderate hypercapnic challenge. The lack of change in neural respiratory drive, or respiratory muscle work suggests improved efferent-afferent matching as a mechanism.