

Differences in the ventilatory response to incremental exercise in people with CF  
according to age and sex

C. A. Williams<sup>1,2</sup>, O. W. Tomlinson<sup>1,2</sup>, N. J. Withers<sup>2</sup>, P. J. Oades<sup>2</sup>, A. R. Barker<sup>1</sup>

1. Children's Health and Exercise Research Centre, Sport and Health Science, University of Exeter, Exeter, United Kingdom

2. Royal Devon and Exeter NHS Foundation Trust Hospital, Exeter, United Kingdom

**Objective:** Maximal oxygen uptake ( $VO_{2max}$ ) is predictive of mortality in CF, independently of lung function [i.e.  $FEV_1$ ], and is significantly different between people with CF of differing disease severity. It is unclear whether dynamic measures of ventilatory function, such as peak minute ventilation ( $V_{Epeak}$ ), differ with age (adult vs. paediatric) and sex groups, considering the importance of static lung measures in CF. This study determines differences in  $V_{Epeak}$ , based upon age and sex in CF.

**Methods:** Data from 87 patients (<18 y = 31 [19 male]; ≥18 y = 56 [32 male]; dF508/dF508 = 31, dF508/other = 46, no dF508 = 10) were included. CPET using a reliable and validated combined ramp-incremental and supramaximal verification cycle ergometer test determined  $VO_{2max}$  and  $V_{Epeak}$ , which were then scaled for body mass. One-way ANCOVA (controlling for  $FEV_1$  and  $VO_{2max}$ ) with Bonferroni post-hoc tests compared age and sex differences in  $V_{Epeak}$ .

**Results:** Mean ( $\pm$ SD)  $VO_{2max}$  for male and female <18 y were 38.9 (6.3) and 28.6 (5.4)  $mL \cdot kg^{-1} \cdot min^{-1}$  respectively and 28.4 (9.1) and 22.7 (5.0)  $mL \cdot kg^{-1} \cdot min^{-1}$  for male and females ≥18 y. Mean  $V_{Epeak}$  for <18 y males and females were 1.77 (0.46) and 1.39 (0.40)  $L \cdot kg^{-1} \cdot min^{-1}$  respectively and 1.39 (0.43) and 1.11 (0.31)  $L \cdot kg^{-1} \cdot min^{-1}$  in male and females ≥18 y. ANCOVA controlling for  $FEV_1$  showed main effects of sex ( $p < 0.01$ ) and age ( $p = 0.04$ ), but no interaction ( $p = 0.60$ ) upon  $V_{Epeak}$ . Pairwise comparisons were significant, with  $V_{Epeak}$  in male adults being significantly greater than females ( $p < 0.01$ ) and male paediatrics being significantly greater than females ( $p = 0.01$ ). When ANCOVA controls for  $VO_{2peak}$ , no effects of age or sex are observed upon  $V_{Epeak}$  ( $p > 0.05$ ).

**Conclusion:**  $V_{Epeak}$  differs between age and sex groups when controlling for  $FEV_1$ , but not  $VO_{2max}$ , suggesting dynamic ventilatory measures are explained by fitness and not

static lung function. This highlights the importance of routine exercise assessments in addition to spirometry in CF management.