



# The effects of 100% oxygen on breathing pattern are not limited to young children

To the Editor:

Breathing 100% oxygen has been reported to decrease tidal volume ( $V_T$ ) in infants [1] and recent evidence published in the *European Respiratory Journal* suggest that transient less pronounced effects are also seen in preschool children [2]. It is unclear whether there is an age dependency beyond infancy in the response to 100% oxygen or whether it is limited to young children. Here we investigate the effects of 100% oxygen on breathing pattern across a spectrum of ages to identify the change in  $V_T$  that occurs when subjects breathe 100% oxygen during a multiple breath nitrogen washout (MBNW) test.

MBNW testing was performed [3] with the Exhalyzer® D using Spiroware 3.1 software (EcoMedics AG, Dürnten, Switzerland). Preschool children were tested using a mask whereas older children and adults used a mouth piece. All trials were re-run through Spiroware 3.2.0 to obtain breath-by-breath output of  $V_T$ , respiratory rate (RR) and minute ventilation ( $V'_E$ ) for all pre-washout and washout breaths. The average  $V_T$ , RR and  $V'_E$  of the last 5 breaths of the pre-phase was compared to each washout breath to calculate a relative change in each parameter. We also compared the final 5 breaths of the pre-phase to the average all of breaths collected during the washout phase. A non-linear regression analysis was used to model the breath-by-breath changes. In total data collected from 112 preschool children (50 healthy and 62 with cystic fibrosis (CF)) [4], 18 school age children (all with CF) [5] and 10 adults (all healthy) were included in the analysis. Combined, the subjects ranged from 2.5 years to 29 years of age (median 4.8 years, interquartile range (3.7–17.5)) and 63% of participants were male.

Exposure to 100% oxygen resulted in an initial decrease in  $V_T$ , RR and  $V'_E$  in all three age groups (figure 1), followed by a return to pre-phase levels. This effect was observed in both healthy subjects and those with CF. The average  $V_T$  of the entire washout was not significantly different when compared to the pre-phase in all groups (0.8% decrease in healthy preschool children, 3.2% and 3.9% decrease in preschool and school age children with CF, respectively, and a 1.6% decrease in healthy adults).

Our findings are thus consistent with two recent studies that compared the average pre-phase  $V_T$  to the average  $V_T$  during the washout phase in preschool [2] and school age children [6]. FOONG *et al.* [2] observed a 13 mL (4.8%) decrease in  $V_T$  whereas JOST *et al.* [6] observed a 9.7 mL (3.5%) decrease in  $V_T$ . In infants, breath-by-breath analysis demonstrated temporary hypoventilation driven by a decrease in  $V_T$  after 2–4 breaths, which remained low for 10–25 breaths before returning to baseline [1]. Therefore, changes in tidal breathing in response to exposure to 100% oxygen observed in infants are not unique to this age group. Rather, they are a phenomena exhibited by subjects of all ages with the magnitude of the effect being small after early infancy. This is important for longitudinal studies with MBNW measurements, as breathing 100% oxygen is unlikely to affect results.

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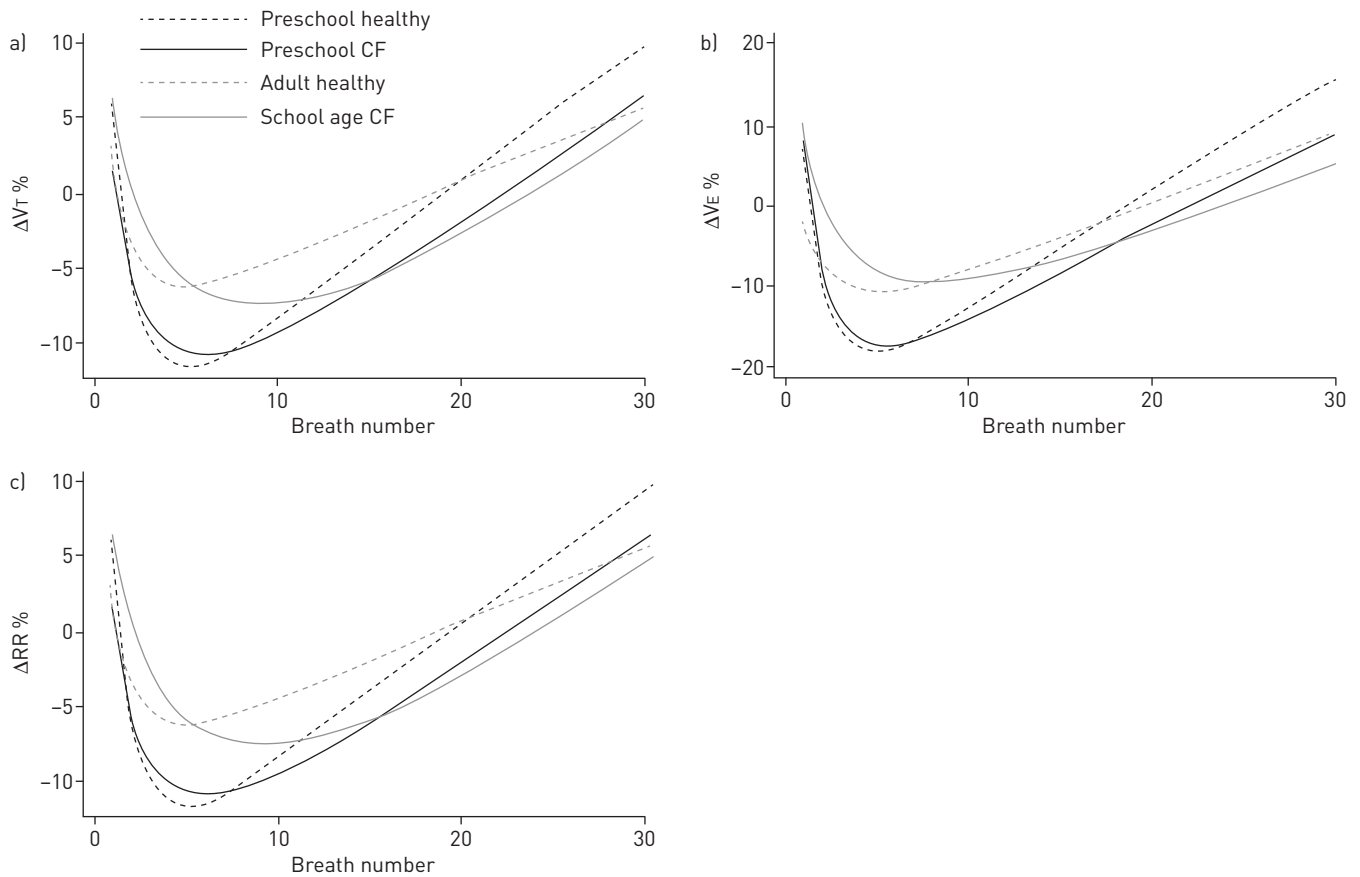


FIGURE 1 Breath-by-breath change in tidal volume ( $V_T$ ) (a), minute ventilation ( $V_E$ ) (b) and respiratory rate (RR) (c) relative to the last five breaths of the pre-washout phase

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