

European Respiratory Society Annual Congress 2012

Abstract Number: 5032

Publication Number: P1147

Abstract Group: 9.1. Respiratory Function Technologists/Scientists

Keyword 1: Lung function testing **Keyword 2:** Exercise **Keyword 3:** Monitoring

Title: Conditioning of whole body plethysmographs (WBPs) for prolonged measurements during exercise

Barbara 19129 Uva barbara.uva@mail.polimi.it¹, Dario 19130 Bovio dario.bovio@polimi.it¹ and Andrea 19131 Aliverti andrea.aliverti@polimi.it¹. ¹ Dipartimento di Bioingegneria, Politecnico di Milano, Milano, Italy

Body: Due to the significant thermal drift determined by variations of temperature (ΔT) and relative humidity (ΔRH) in the box, in clinical practice WBPs are used only over short measurement periods. To allow measurements of lung volume variations by WBP over long periods and exercise tests, we developed 3 different air conditioning systems (A: peltier cells and fans; B: continuous bias flow produced by a negative pressure source; C: bias flow and fans) and studied their effects on ΔT and ΔRH within a flow-type WBP. In 5 healthy subjects, ΔT and ΔRH were measured during 1' of quiet breathing (QB), 5' of calf contraction submaximal constant exercise (EX) and 4' of recovery (REC). In all subjects, ΔT and ΔRH were similar during QB, EX and REC. T increased linearly during QB and EX with different slopes and then plateaued during REC. Conversely, RH did not vary during QB and changed nonlinearly during EX and REC. During QB, ΔT averaged 0.3 ± 0.2 (SD), 0.3 ± 0.1 and 0.3 ± 0.1 °C and ΔRH 1.4 ± 1.5 , 2.4 ± 2.2 and 1.6 ± 1.5 %, respectively with A, B and C conditioning. During EX, ΔT was 0.8 ± 0.2 , 1.0 ± 0.3 and 0.7 ± 0.3 °C and ΔRH 17.1 ± 12.0 , 28.1 ± 7.2 and 24.7 ± 7.9 %, respectively with A, B and C conditioning. A and C were significantly more effective than B in controlling ΔT during both QB and EX ($p < 0.001$). A was more effective than B and C in controlling ΔRH during both QB and EX ($p = 0.001$). In conclusion, combining a cooling device with air recirculation allows to keep T constant inside the WBP during prolonged measurements, even during EX. None of the 3 considered conditioning systems allows to control RH, however, the repeatability of RH variations suggests that thermal drift can be corrected by dedicated software.