

Association between the first ventilatory threshold and the lean mass

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Introduction. The first-ventilatory threshold (VT), exercise level at the onset of anaerobic metabolism stimulating the ventilatory response beyond the metabolic demand, is important to consider in the management of different pathologies. We hypothesized that larger leg muscle mass (LMleg) is associated with higher VT, as measured during a cyclo-ergometric cardiopulmonary exercise test (CPET).

Methods. 316 healthy adults or patients (118 women, 94 with obesity, 113 with cardio-vascular disease, and 49 with diabetes) underwent a DEXA scan for body composition assessment and a CPET. 188 subjects repeated the measurements: 17 after bariatric surgery and 171 after 3 months of aerobic and resistance training. VT was estimated by two independent investigators using the V-slope and the VCO₂/VO₂ kinetic technique.

Results. As hypothesized, LMleg was correlated to VT (ml/min) independently of sex, age, BMI, pathology or fitness ($r=0.51$, $p<.001$). LMleg and VT (ml/min) were also correlated after bariatric surgery, when VT and LMleg decreased ($p=.01$ and $p<.001$) but also after training when VT increased ($p<.001$) with little changes in LMleg ($p>.05$). However, VT changes were not associated to LMleg changes.

VT when expressed in relation to body weight (L/min/kg) and VO₂peak (%VO₂peak) was correlated to total and visceral fat mass ($r=-0.50$, $p<.001$), disadvantaging subjects with an unfavourable body composition.

Conclusion. Higher LMleg is associated to higher VT, allowing higher exercise intensity to be reached before the onset of anaerobic metabolism which exacerbates ventilation. Weight loss- or training-induced VT changes are probably rather related to muscle oxidative capacity adaptations than changes in muscle mass.