Normalizing VO

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Maximal aerobic capacity (VO\textsubscript{2max}) is currently the gold standard in assessing aerobic fitness. Normalizing VO\textsubscript{2max} by body mass remains conventional, but is limited by its failure to explain gender differences, thus making interpretation and comparisons between genders difficult.

Purpose: To determine if normalizing aerobic fitness by body composition ameliorates the sex differences between male and female collegiate athletes.

Methods: 59 NCAA Division 1 athletes (19 M soccer, 12 M hockey, 14 W soccer, and 14 W hockey) completed testing immediately prior to their competitive seasons. Body weight, total lean body mass (LBM), lower extremity (LE) LBM and body fat (BF) were determined by dual energy xray absorptiometry (DXA). A progressive maximal treadmill test was administered to determine VO\textsubscript{2max} and ventilatory threshold (VT). Body composition variables were compared between genders using independent t-tests. Aerobic fitness measures were compared between genders when expressed absolutely and after being normalized by body weight, LBM, and LE LBM.

Results: Males had higher LBM (63.8±7.2 v 47.2±4.3 kg, p<0.001), LE LBM (22.1±2.7 v 16.8±1.8 kg, p<0.001) and lower BF (11.6±3.0 v 17.0±3.6 kg, p<0.001) compared to females. Similarly, males had higher VO\textsubscript{2max} compared to females when expressed absolutely (5.01±0.59 v 3.54±0.39 L/min, p<0.001), in terms of body mass (63.4±6.2 v 53.4±5.7 ml/kg/min, p<0.001) and LE LBM (212.8±26.5 v 198.6±23.0 ml/kg\_LELBM/min, p=0.017). When normalized by LBM, however, the differences in VO\textsubscript{2max} were no longer significant (78.8±7.0 v 75.4±8.7 ml/kg\_LBM/min, p=0.088). Males showed higher VT when expressed absolutely (3.63±0.60 v 2.43±0.44 L/min), and additionally when normalized for body mass (45.9±6.9 v 36.4±5.8, p<0.001), LBM (57.1±8.4 v 51.6± 9.2 ml/kg\_LBM/min, p=0.018), and LE LBM (165.3±25.7 v 145.6±26.6 ml/kg\_LELBM/min, p=0.018).

Conclusions: Gender differences in VO\textsubscript{2max} are no longer significant when normalized by LBM, while gender differences in VT between persist. This data supports normalizing maximal aerobic capacity in terms of LBM rather than by body mass to compare levels of aerobic fitness in collegiate athletes.