

## **Influence of Anthropometric Variables on Three Different Maximal Oxygen Consumption Units: NHANES 2003-2004**

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Maximal oxygen consumption ( $\text{VO}_2\text{max}$ ) has traditionally been reported in absolute units (L/min) or units relative to total body mass (mL/kg/min). However, expressing  $\text{VO}_2\text{max}$  relative to fat free mass (mL/kg<sub>FFM</sub>/min) has recently become more common due to the belief that this unit is a more direct measure of muscle aerobic capacity and is less influenced by other anthropometric measures. **PURPOSE:** To determine the influence of common anthropometric measurements on  $\text{VO}_2\text{max}$  measurements expressed in three different units: absolute, relative to total body mass, or relative to fat free mass. **METHODS:** Data from the 2003-2004 NHANES were used. All subjects included in the analysis were between the ages of 18-35 (mean:  $24.8 \pm 5.6$ ) and had complete data for the following variables:  $\text{VO}_2\text{max}$ , waist circumference, height, weight, body mass index (BMI), percent body fat, and fat free mass. Bivariate correlations between three different  $\text{VO}_2\text{max}$  units (L/min, mL/kg/min, and mL/kg<sub>FFM</sub>/min) and other previously mentioned variables were performed by weight class (normal [N], overweight [OW], and obese [OB] by BMI). **RESULTS:** Height has moderate correlations with absolute  $\text{VO}_2\text{max}$  values (N = 0.596, OW = 0.697, OB = 0.578; all  $p < 0.01$ ) and  $\text{VO}_2\text{max}$  relative to total body mass (N = 0.345, OW = 0.332, OB = 0.280; all  $p < 0.01$ ), but has little impact on  $\text{VO}_2\text{max}$  relative fat free mass (N = 0.111, OW = 0.024, OB = -0.057; N only  $p < 0.05$ ). Body fat percentage primarily has a moderate negative correlation with absolute  $\text{VO}_2\text{max}$  (N = -0.061, OW = -0.584, OB = -0.403; all  $p < 0.01$ ) and  $\text{VO}_2\text{max}$  relative to total body mass (N = -0.565, OW = -0.460, OB = -0.452; all  $p < 0.01$ ), but has little impact on  $\text{VO}_2\text{max}$  relative to fat free mass (N = -0.129, OW = 0.044, OB = 0.135; N and OB only  $p < 0.05$ ). Significant relationships between the various anthropometric measurements assessed and  $\text{VO}_2\text{max}$  values were generally weakest with  $\text{VO}_2\text{max}$  as expressed relative to fat free mass. **CONCLUSIONS:**  $\text{VO}_2\text{max}$  expressed relative to fat free mass (mL/kg<sub>FFM</sub>/min) has less co-linearity with common body anthropometric measurements than  $\text{VO}_2\text{max}$  expressed in absolute terms (L/min) or relative to total body mass (mL/kg/min). Therefore,  $\text{VO}_2\text{max}$  units expressed relative to fat free mass should be reported when comparing subjects of different weight classifications. Authors have no disclosures to report.