

### Measured Thoracic Gas Volume Versus Two Predictions

JACOB MCBRIDE, STEVEN SPENCER, BRADLEY PENROSE, BROOKLYN MURRI, EDWARD M. HEATH, FACSM, & DALE R. WAGNER, FACSM

USU Body Composition Laboratory; Kinesiology and Health Science; Utah State University; Logan, UT

---

*Category: Undergraduate*

*Advisor / Mentor: Wagner, Dale (dale.wagner@usu.edu)*

#### ABSTRACT

Body composition, or one's fat mass relative to total mass, is important to a person's health and physical performance. One method to measure body composition is the Bod Pod air displacement plethysmograph. To determine body volume from the Bod Pod, thoracic gas volume (TGV), or the volume of air in the lungs during a normal breath, must be measured or predicted. **PURPOSE:** The intent of this study was to compare measured TGV to two predictions: one from the Bod Pod ( $TGV_{BP}$ ) that makes assumptions about functional residual capacity and tidal volume, and one from a recent publication ( $TGV_{Ducharme}$ ) that relies on measures of height and body mass rather than lung volumes. **METHODS:** Bod Pod data from university club sport athletes participating in a larger study were used. TGV was measured following the Bod Pod manufacturer's instructions. Comparisons of mean data were made between the measured test and the two predictions with a one-way repeated-measures ANOVA. Individual error scores were evaluated with Bland-Altman plots. **RESULTS:** Data from 26 club sport athletes (18 male, 8 female) revealed a statistically significant difference ( $p = .001$ ) between the three TGV measures. The measured TGV ( $4.108 \pm 0.850$  L) and  $TGV_{Ducharme}$  ( $4.092 \pm 0.655$  L) were not significantly different from one another ( $p = .851$ ), but  $TGV_{BP}$  ( $3.724 \pm 0.409$  L) significantly underestimated the measured TGV ( $p = .002$ ) and Ducharme's prediction ( $p < .001$ ). A clear bias exists for  $TGV_{BP}$  ( $r = -0.799$ ,  $p < .001$ ), such that the Bod Pod prediction overestimates athletes with a small TGV ( $< 3.3$  L) and underestimates athletes with a large TGV ( $> 3.3$  L). The bias for  $TGV_{Ducharme}$  is statistically significant ( $r = -0.460$ ,  $p = .018$ ), but much smaller than the bias from the Bod Pod prediction. **CONCLUSION:** When possible, measure TGV. If TGV must be predicted, use the Ducharme prediction rather than the TGV prediction from the Bod Pod.