Comparison of the United States Air Force Circumferential Measurement Technique and Air Displacement for the Determination of Human Body Composition at Moderate Altitude.

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**Introduction:** The current Air Force procedure for body fat assessment uses a circumferential measurement technique (1). A false positive value, one being over the AF standard that really shouldn’t, can result in disciplinary action taken against the Air Force member. A new, simpler method using an air displacement plethysmograph (BodPod) was being explored as an alternative. The purpose of this study was to compare the circumferential measurement (CIR) technique with an air displacement method (BodPod) and hydrostatic weighing (HW) for the determination of human body composition. **Methods:** Percent body fat was measured in 239 subjects (84 females, 155 males) aged 20-52 yrs who completed the required paperwork including an informed consent form. The subjects were required to complete all portions of the study on the same day. Each subject was tested in the same chronological order. The BodPod (2, 3) was the first procedure as the subject needed to be dry and in minimal clothing (Speedo type swimsuit). Upon completion of the BodPod testing each subject was measured using the Air Force CIR body assessment procedure. A standard measurement was determined for females by adding the two measurements of the hips (widest point) and waist (slimmest point) and then subtracting the circumference of the neck. A similar procedure was used for males; however, the neck measurement is subtracted solely from the waist measurement. Neck measurements are rounded up to the nearest half-inch and the waist and hip measurements are rounded down to the nearest half-inch. The resultant is entered into a regression equation and % body fat calculated (1). The subjects were then hydrostatically weighed. Each subject was tested a minimum of five times (additional measurements if subjects result improved after test 5 and/or subsequent measurements). The recorded result was an average of the highest two readings of the submerged body weight recordings. Body fat was determined using the SIRI equation. The subjects were then escorted to the Air Force Academy hospital to be assessed for true residual lung volumes using a full-body plethysmograph. **Statistics:** A one-way analysis of variance (ANOVA) was used to determine if a different existed between the three body fat measurements. Additionally the Student-Newman-Keuls post hoc test was used to determine which means differed at an alpha level of 0.05. **Results:** Values for mean ± SD percent body fat from HW, BodPod, and CIR were 17.93% ± 7.9%, 22.46% ± 8.6% and 21.74% ± 7.6%, respectively. These means were significantly different (p<0.001). Poc hoc analysis showed that HW was significantly different than both BodPod and CIR (p<0.05), while BodPod and CIR body fats were not significantly different. **Discussion:** These findings indicate that both the BodPod and CIR over-predicted body fat by 17.5-20% in adult humans at moderate altitudes. These results agree with Shake (1), which suggests that caution should be utilized when using the CIR method for making career decisions on Air Force personnel. This data also suggests that the BodPod is not a valid method for determining % body fat in adult humans at moderate altitude. Additional research with the BodPod at this altitude is necessary in the future.