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An Equation To Estimate Head Volume For Hydrostatic Weighing In Partially Immersed Subjects

Panayiotis Papadopoulos[1], Forrest A. Dolgener[1], David M. Reineke[2], Jeff C. Tesch[3]. [1]*University of Northern Iowa, Cedar Falls, IA.* [2]*University of Wisconsin-La Crosse, La Crosse, WI.* [3]*EXERTECH, Dresbach, MN.* (Sponsor: Kevin J. Finn, FACSM)
Email: panayiotis.papadopoulos@uni.edu

Reported Relationships: P. Papadopoulos: Other (please describe); One of the authors (Jeff C.Tesch) is the vendor of the equipment used in the study..

PURPOSE: The purpose of the study was to derive prediction equations for head volume (HV) from head girths and diameters and to use the equations for hydrostatic weighing (HW).
METHODS: HW was performed with and without head submersion of subjects using a computerized, 4 load cell weighing system. Forty-four males and 46 females comprised the experimental groups from which equations were derived to predict HV by water displacement. HW was then performed on 46 additional subjects (21 males and 25 females) to compare body density (BD) and body fat percent (BF%) for head below water (HBW) and head above water (HAW) immersion using the HV prediction equations. Subjects exhaled to residual volume and maintained the same lung volume during the HAW phase and the HBW phase of each immersion trial.
RESULTS: Head girths showed higher correlations and smaller SEEs than head diameters for the prediction of HV. Regression analysis indicated that the equations with the highest R^2 and the lowest SEE were from head girth (HG), face girth (FG) and body mass in air (MA). The equation for males was $HV = 0.1294 \cdot HG + 0.0299 \cdot FG + 0.0055 \cdot MA - 5.7506$ ($R^2 = 0.57$, SEE = 0.26 L). The equation for females was $HV = 0.1314 \cdot HG + 0.0504 \cdot FG + 0.0094 \cdot MA - 8.9008$ ($R^2 = 0.73$, SEE = 0.21 L). The validation groups showed no significant differences ($p < 0.05$) in BD between HAW immersion and HBW immersion for either males ($R^2 = 0.98$, SEE = 0.0028 $g \cdot ml^{-1}$) or females ($R^2 = 0.90$, SEE = 0.0054 $g \cdot ml^{-1}$). There were no significant differences ($p < 0.05$) in BF% between HAW immersion and HBW immersion for either males ($R^2 = 0.98$, SEE = 1.16%) or females ($R^2 = 0.90$, SEE = 2.24%). Fluctuations in weight scale readings were significantly lower ($p < 0.05$) for HAW immersion than for HBW immersion in both males (SD_{HAW}= 0.31 kg, SD_{HBW}=0.40 kg) and females (SD_{HAW}=0.22 kg, SD_{HBW}=0.30 kg).
CONCLUSIONS: Weight readings are more stable and BD and BF% are not significantly different when HW is performed without head submersion using predicted HV.

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Test-retest Reliability Of Total Body Volume Derived From A Single 2-dimensional Digital Image

Michael Vernon Fedewa, Katherine Sullivan, Clifton J. Holmes, Bjoern Hornikel, Shengting Cao, Yu Gan, Michael R. Esco, FACSM. *University of Alabama, Tuscaloosa, AL.* (Sponsor: Michael R. Esco, FACSM)
Email: mvfedewa@ua.edu

Reported Relationships: M.V. Fedewa: Receipt of Intellectual Property Rights/Patent Holder; Provisional Patent Submitted. Dr. Fedewa developed the Intellectual Property related to this abstract as part of his research at the University of Alabama.

Simple, accurate, and cost-effective methods to estimate body composition in field settings are valuable to practitioners and clinicians. An automated smartphone- or tablet-based method of determining body composition from a single 2-dimensional (2D) digital image has recently been developed. However, the test-retest reliability has yet to be determined.
PURPOSE: The purpose of this study was to evaluate the test-retest reliability of total body volume (BV) estimated from a single 2D digital image.
METHODS: A convenience sample was recruited for this study (n=30, 21.0±3.1 yrs., 86.7% female, 24.8±3.0 kg/m^2). Body mass was measured (to the nearest 0.1 kg) with a calibrated digital scale (Tanita BWB-800, Tanita Corporation, Tokyo, Japan). Standing height was measured (to the nearest 0.1 cm) with a stadiometer (SECA 213, Seca Ltd., Hamburg, Germany). Two digital images of each participant were taken from the rear/posterior view using a 12.9 inch, 64g iPad Pro. A paired sample T-test was used to examine differences between BV obtained from the images (BV_1, BV_2). An Intraclass Correlations Coefficient (ICC) assessed the strength of the association between BV_1 and BV_2.
RESULTS: No differences were observed between BV_1 and BV_2 (71.2±12.0 L versus 71.1±11.7 L, respectively, p=0.51), with excellent agreement between the two measures (ICC=0.99).
CONCLUSIONS: This novel method of acquiring BV produced near-perfect reliability within our small sample. Given the excellent reliability, future research should examine the validity of acquiring body composition from a single 2D digital image using an automated smartphone- or tablet-based application.

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Acute Exercise And Resulting Dehydration Does Not Alter Body Composition Measures Using Fit3D

Emily A. Freund, Jennae M. Fenton, Nick J. Rein, Courtney D. Jensen, J. Mark VanNess. *University of the Pacific, Stockton, CA.*
Email: e_freund@u.pacific.edu

(No relationships reported)

Fit3D is a novel, camera-based system to assess anthropometric measurements and determine body composition. Little data exist on how the values generated by this system may be influenced by acute exercise and associated dehydration and fluid shifts.
PURPOSE: To determine the effect of a prolonged bout of acute exercise on the body composition measures generated by the Fit3D.
METHODS: 17 subjects (7 female, 10 male) underwent body composition analysis using the Fit3D before and after one hour of acute exercise. The exercise protocol consisted of a maximal treadmill exercise test to volitional fatigue followed by 40 min of continuous exercise at the estimated anaerobic threshold calculated by taking 65% of each subject's ventilatory threshold. Each subject had their vitals (heart rate, blood pressure, and scale weight) taken, provided a urine sample to measure specific gravity, and performed a Fit3D scan before and after the exercise bout.
RESULTS: Subjects lost 2.5±1.8 lbs during exercise. This loss of body water was associated with an increase in urine specific gravity of .007±.004. These changes did not influence any of the circumference measures and only slightly influenced percent body fat measured on the Fit3D. Pre-to-post measures of body fat (24.5±6.9% vs 24.8±6.7%), trunk-to-leg volume ratio (1.45±0.59 vs 1.49±0.56), fat mass (73.4±15.7 vs 72.5±15.6kg), lean mass (54.9±9.9 vs 54.1±10.2 kg), and basal metabolic rate (1637±242 vs 1630±242 cal/day) were not statistically different (p=0.894, 0.876, 0.999, 0.822 and 0.930 respectively).
CONCLUSION: Our results provide preliminary evidence that the Fit3D instrument is a consistent tool for assessment of body composition even after a bout of acute exercise resulting in the loss of body water.

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Body Composition And Aerobic Fitness Levels In College Freshmen

Nicole Varone, Vipa Bernhardt. *Texas A&M University Commerce, Commerce, TX.* (Sponsor: Tony G. Babb, FACSM)

(No relationships reported)

BACKGROUND: Research has shown that college students exhibit gains in fat mass that are up to 5.5 times greater than their peers of the same age who do not attend college (Mihalopoulos et al, 2008).Because of concerns over increasing rates of obesity, college campuses nationwide are engaging in campaigns designed to target college youth and educate them about the benefits of healthy lifestyle behaviors. In order to implement effective intervention strategies, a clear picture of current student fitness must be acquired.
PURPOSE: The purpose of this study was to examine objective measures of body composition and aerobic fitness levels in current first year students of a rural university.
METHODS: 24 participants (17F/7M, 18±1yr, 167.5 ±72.0 cm, 67.9±17.1kg, 24.5 ±5.2kg/m^2 BMI) underwent dual energy x-ray absorptiometry for body fat determination and performed the Astrand submaximal bicycle ergometer test with metabolic measurements (e.g., VO_2), from which estimated VO_2max was extrapolated. The International Physical Activity Questionnaire (IPAQ) was administered to gather subjective self-evaluation of weekly exercise volume.