VALIDITY OF BODY FAT MEASUREMENT AND EXERCISE FACTORS THAT AFFECT PERCENT BODY FAT IN WOMEN.

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The assessment of body composition is recognised as important among athletes and sedentary individuals, with the main focus on the proportion of body fat. The technique of dual-energy X-ray absorptiometry (DEXA) provides quantitative measurements of fat mass (FM) and percent body fat (%BF). The aims of this study are to conduct in vitro and in vivo validation of the DEXA method of measuring fat mass and percent fat (using porcine carcass dissection, skinfold measurements and hydrodensitometry [UWW]) and to use data from a female cohort (n = 54) observed using DEXA to determine how exercise can affect FM and %BF.

The DEXA method produced lower (P < 0.05) mean values than the porcine dissection method for FM (1.49 ± 0.51 kg and 1.60 ± 0.64 kg) and %BF (11.3 ± 1.9 % and 12.2 ± 2.0 %). Despite the differences between the dissection and DEXA values, the two methods were strongly correlated (P < 0.001: FM: r = 0.987; %BF: r = 0.865). The various skinfold formulae values ranged from 24.7 % ± 5.1 % to 32.7 ± 8.2 %. Further analysis showed that there was no difference between the methods of UWW (29.0 ± 6.8 %) and DEXA (28.4 ± 6.4 %), and between DEXA and the skinfold formulae of Jackson and colleagues’ (1980) sum of 3 (29.4 ± 6.7 %) and sum of 7 sites (27.0 ± 6.5 %). Correlation analysis demonstrated that body mass index (BMI) was moderately correlated (although only explaining 45 % of the variation) to %BF as determined by DEXA (r = 0.674; P < 0.01). Waist-to-hip ratio (WHR) was weakly correlated to %BF (r = 0.270; P < 0.05). Independently the waist and hip girths had stronger correlations with % BF (P < 0.01: r = 0.644 and 0.778 respectively) than either BMI or WHR.

The %BF derived using DEXA as determined by the previously validated DEXA method, was correlated to the duration of impact activity undertaken during a typical week (P < 0.05: r = -0.300), but not to non-impact activity (P > 0.05) of the female cohort. The women’s %BF was related to the time spent running per week (r = -0.331), the typical number of miles ran per week (-0.292), the amount of vigorous exercise (r = -0.346) and the number of exercise sessions undertaken in a week (r = -0.292). A significant difference (P < 0.05) was observed between the level of sport participation and %BF (sedentary (n = 13): 31.5 ± 6.9 %, recreational (n = 34): 28.2 ± 6.2 %, club (n = 7): 23.4 ± 1.2 %).

In conclusion, there was very close agreement between values of %BF generated using DEXA and dissected porcine legs. Furthermore, the %BF of women can be accurately predicted by using the skinfold formulae of Jackson et al. (1980) and hydrodensitometry. Body mass index can be used to estimate %BF, but individual waist and hip girths should be used in preference to WHR. These observations support the adoption of vigorous exercise for weight management and offer only weak support for the use of conventional surrogates of body composition in public health research.

Keywords: Exercise and Health, Body Composition, Body Fatness