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Editorial

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Body Composition: A Necessary Tool in Individuals With Disabilities?

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The 2016 Summer Olympics, also known as the Games of the 31st Olympiad concluded last month with the 2016 Paralympics set to begin in early September. Advancements in training techniques, clothing and footwear continue to contribute to the establishment of new records at the Summer Olympics. Likewise, advancements have been made for Paralympic athletes in both prosthetics- and wheelchairs. However, a key factor in the performance of all athletes is body composition, but the development of accurate field methods for measuring body composition for disabled athletes lags behind comparable measures for able-bodied athletes.

Body composition is a primary component of physical fitness[1] and individuals with disabilities are faced with an even greater amount of imposed sedentary time than their able-bodied counterparts. A physical disability that results in the individual using a wheelchair is associated with changes in body composition, specifically in the lower limb area. These changes can be due to immobilization and decreased movement and activity levels[2] and must be taken into consideration when assessing factors such as fat mass (FM), fat-free mass (FFM), body density (BD) and percentage of body fat (%BF) within disabled populations.[3-5] Hydrostatic weighing can be awkward for paraplegics, therefore, anthropometry (skinfolds, circumferences, and diameters), which was developed in normal populations, has been viewed as an alternative. But body composition differences such as the loss of lean tissue in the lower extremities, changes in bone mineral density, and fluid shifts affect the primary assumptions made regarding density of mineral, protein, and fat when converting body density to percent body fat.[6] The unusual upper body development of the paraplegic athlete and the decreased bone mineral density in the lower limbs result in an underestimation of fat mass in these subjects.[7]

The most common field testing methods of body composition in individuals with disabilities are body mass index (BMI),[8] skinfolds,[6] and bioelectrical impedance analysis.[4] BMI can be calculated quickly from measured or reported height and weight (kg/m^2) and has been used as a measure of adiposity to predict disease risk, including in patients with a spinal cord injury (SCI).[9,10] Body weight comprises lean tissue, fat tissue and bone mass; so, if BMI is the only measure, adiposity may not be accurately identified. However, Jones, Legge and Goulding,[8] determined that many individuals with SCI do not appear obese, have a healthy BMI, yet, carry large amounts of fat tissue as determined by dual-energy x-ray absorptiometry (DXA). This finding supports the need to develop reliable field methods of determining FM and FFM in individuals with disabilities

Bioelectrical impedance analysis (BIA) is a simple, non-invasive procedure that has been widely used in clinical settings to estimate total body water and fat free mass of able-bodied populations. It measures the impedance to the flow of a low-level electrical current throughout the body. This measurement assumes that the impedance within the tissues will be constant for all body segments. However, SCI-related changes in the lower body, may alter the tissue impedance due to changes in protein and mineral content of the paralyzed extremities. Measurement of the impedance of body segments may provide more accurate information.[11,12]

Given the limitations of current field testing, it is imperative that researchers further refine body composition testing for disabled athletes. The development of reference measures to accurately quantify the constituents of the fat free body in the wheelchair population might be a place to start. Kocina[4] suggests using laboratory-based methods such as hydrometry for to-

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tal body water, DXA for bone mineral content, bone mineral density and lean tissue mass to establish the reference measures. Then, skinfold and BIA equations may be developed to accurately estimate body composition. However, the continued challenge will be the varying degrees of impairment with those with SCI or paraplegia from other causes.

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