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Fatness of female field hockey players: Comparison of estimates with different methods



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ABSTRACT

The aim of the study was to compare relative body fat (% fat) in female field hockey players using several methods with dual-energy X-ray absorptiometry (DXA) as the reference. Participants were 31 Polish hockey players 16–30 years of age, 17 national and 14 youth level. Percent body fat was estimated by DXA (reference method), conventional and segmental bioelectrical impedance analysis (BIA), and predicted from skinfolds (SKF). National and youth team members did not differ in estimated body fat. Correlations between BIA and skinfold estimates of % fat and DXA % fat though significant, were moderate. Both % fat SKF and % fat SBIA differed significantly from % fat DXA, while estimated % fat BIA and % fat DXA did not differ. Limits of agreement were narrow for conventional BIA (−1.20 to 1.71% fat), followed by segmental BIA (3.72–6.09% fat) and broadest for SKF (5.97–9.28% fat). Differences between DXA % fat and estimated % fat with SKF and SBIA increased from the leanest to fattest athletes, whereas conventional BIA overestimated % fat relative to DXA in the small sample of individuals with low relative fatness and underestimated % fat in individuals with elevated relative fatness. Estimated % fat from conventional

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BIA most closely approximated DXA % fat in this sample of female field hockey players suggesting that the method may be suitable for field surveys to monitor body composition during the season.

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Introduction

Physical characteristics of players, including size, physique and body composition, are among a number of factors that influence performance in many sports (Elferink-Gemser et al., 2004; Williams and Reilly, 2000). This is apparent in descriptions of the anthropometric and body composition characteristics of female field hockey players (Calo et al., 2009; Fornetti et al., 1999; Keogh et al., 2003; Sloan et al., 1962; Sparling et al., 1998; Warner et al., 2004; Wassmer and Mookerjee, 2002). Body composition merits further study as advances in technology have provided additional methods and insights (Ackland et al., 2012; Heymsfield et al., 2005; Malina, 2007; Roche et al., 1996). Along with advances in technology, models have evolved from the traditional two compartments (body mass = fat-free mass [FFM] + fat mass [FM]) to models including three, four or five compartments (Wang et al., 1992, 2005). Fat mass is basic to all models. The advances highlight a need for comparative studies of methods.

In addition to methods *per se*, variation in body composition influences the functional capacities and performances of athletes in many sports. For example, increased body fatness was associated with poorer performance in aerobic and anaerobic capacities in male lacrosse players (Collins et al., 2014). Higher levels of relative fatness (% fat) were associated with faster onset of fatigue during aerobic and intermittent activities. Given the nature of team sports requiring high levels of the relative strength, agility, speed and endurance, there is a need to consider body composition as a potential factor affecting these functional capacities. It was suggested, for example, that a key to the success of national level volleyball players was lower relative fatness (Fleck et al., 1985). Indeed, among Spanish Super-League female volleyball players, greater levels of fatness were associated with poorer performances (Mielgo-Ayuso et al., 2015). The observations are consistent with data that indicate a negative relationship between relative fatness and performances in a variety of sports especially those with a major endurance component or with emphasis on both speed and endurance as in field hockey and soccer (Fornetti et al., 1999; Maughan and Burke, 2002; Svantesson et al., 2008). Given the relationship between fatness and performance, there is interest in regular monitoring of body composition during a sport season (Malina, 2007). Emphasis on relative fatness does not overlook the significance of fat free mass, which is highly correlated with height, a selective factor in many sports but apparently not in field hockey given the generally semi-crouched position in the execution of skills specific to the sport. However, a relationship between tallness and back strain has been postulated in the sport (Reilly and Borrie, 1992).

Given variability in methods for estimating body composition, specifically relative body fat (% fat), the comparability of estimates is a concern (Bentzur et al., 2008; Fornetti et al., 1999; Mala et al., 2010; Romero et al., 2009; Santos et al., 2010; Silva et al., 2006; Warner et al., 2004). The purpose of this study, therefore, is to compare estimates of % fat among youth and adult female field hockey players using several methods with the dual energy X-ray absorptiometry (DXA) estimate as the reference. Although field hockey is played in many countries (Anders and Myers, 2008) it is relatively recent in Poland and has only recently increased in popularity among females.

Materials and methods

Participants

The study was approved by the Human Ethics Research Committee of the Poznań Medical University (No 972/11, 01.12.2011, Prof. Zygmunt Przybylski, chairman) and of the University School of Physical Education in Poznań, Poland. The study was also approved by the Polish Field Hockey Association, coaches, national team players, and the legal guardian of each young player. The athletes were

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