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The mediating role of physical self-concept on relations between biological maturity status and physical activity in adolescent females

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A B S T R A C T

The current study examined the mediating role of physical self-concept on relations between biological maturity status and self-reported physical activity in adolescent British females. Biological maturity status, physical self-concept and physical activity were assessed in 407 female British year 7–9 pupils (M age = 13.2 years, SD = 1.0). Participants completed the Physical Activity Questionnaire for Adolescents (Kowalski, Crocker, & Donen, 2004) and the Children and Youth Physical Self-Perceptions Profile (Whitehead, 1995). Percentage of predicted adult height attained at measurement was used as an estimate of biological maturity status. Structural equation modelling using maximum likelihood estimation and bootstrapping procedures revealed that perceptions of sports competence, body attractiveness and physical self-worth mediated an inverse relation between maturity status and physical activity. The results provide partial support for Petersen and Taylor's (1980) Mediated Effects Model of Psychological and Behavioural Adaptation to Puberty within the context of physical activity.

The physical and psychological health benefits associated with regular involvement in moderate-to-vigorous bouts of physical activity are well documented. Indeed, individuals who are regularly active demonstrate improved functional capacity and are at a reduced risk for several degenerative diseases and psychological disorders, including coronary heart disease, hypertension, type II diabetes depression, and anxiety (Department of Health Physical Activity Health Improvement and Prevention, 2004). To accrue and optimize these benefits, however, regular involvement in physical activity should be encouraged from an early age. This withstanding, evidence gained over the past 40 years suggests that youth have become increasingly less active in many different contexts, including active transport (e.g., walking or cycling to school), physical education, and leisure-time exercise activities (Malina & Katzmarzyk, 2006).

In attempts to understand and promote physical activity in youth, researchers and practitioners have focussed predominantly on psychosocial and environmental factors such as motivation, social support, socio-economic status, and the built environment. Although there is little doubt that such factors contribute to individual differences in physical activity; a true explanation of children's involvement in physical activity resides in the independent and interactive effects of various biological, psychosocial and environmental factors. This philosophy, termed 'a biocultural perspective' (Malina, 2008), extends beyond the

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social and psychological domains, recognizing the importance of biological factors. Physical activity is, after all, a biological process that exists within a complex cultural context in which various values, meanings, and sanctions are ascribed to it. Consistent with a biocultural perspective, the International Association for the Study of Physical Activity and Obesity Task Force (Katzmarzyk et al., 2008) recently recommended that researchers consider the independent and interactive effects of biological determinants upon physical activity and obesity in youth, with the goal of informing both theory and practice.

Researchers studying physical activity and health in youth would do well to consider the independent and interactive effects of biological growth and maturation. Growth refers to changes in body size, composition, proportions and physique (Malina, 2002), whereas maturation refers to progression towards the mature state (Malina, Bouchard, & Bar-Or, 2004).

Maturation status (i.e., the extent to which an individual is advanced, on time, or delayed in maturation) might impact involvement in physical activity, particularly during adolescence when maturity-associated variation in size, proportions, body composition, and functional capacity (e.g., speed, strength, stamina) is greatest (Baxter-Jones, Eisenmann, & Sherar, 2005; Cumming, Standage, Gillison, & Malina, 2008). In males, advanced maturation is associated with greater gains in height, weight, weight-for-height and lean mass, resulting in a physique that is better suited for success in many forms of physical activity, particularly those that emphasise speed, power, and strength (Malina et al., 2004). Advanced maturation in girls is also associated with greater gains in height, weight, and weight-for-height. However, gains in weight include a major fat component and physique changes that may be less appropriate for successful engagement in physical activity, especially in activities that involve weight bearing, endurance, or an aesthetic component, such as distance running or gymnastics (Malina et al., 2004).

The extant literature examining relations between biological maturity status and physical activity during adolescence, though limited and equivocal, suggests that advanced maturation is associated with less involvement in physical activity among girls, and marginally greater involvement in physical activity among males. In a sample of 5595 British 11-year olds an inverse relation between pubertal status and physical activity was noted in girls but not in boys (Riddoch et al., 2007). Moreover, advanced maturation in US females at 11 years has also been shown to be associated with less involvement in moderate-to-vigorous forms of physical activity at the age of 13 years (Baker, Birch, Trost, & Davison, 2007; Davison, Werder, Trost, Baker, & Birch, 2007). In contrast, a weak positive association has been observed between maturity status and moderate-to-vigorous physical activity in 7th grade US boys and girls (van Jaarsveld, Fidler, Simon, & Wardle, 2007), and studies of Scottish girls aged 11–13 years (Niven, Fawkner, Knowles, & Stephenson, 2007), US boys and girls 13–14 years (Wickel & Eisenmann, 2007), and Canadian girls aged 8–16 years (Sherar et al., 2009) have failed to demonstrate associations between maturity status and physical activity. It should be noted that these studies have employed a variety of measures of biological maturation and physical activity and thus may not be directly comparable. Although indicators of sexual, skeletal, somatic, and hormonal maturation are positively related with one-another (Malina et al., 2004), it is possible that physical activity varies with different indices of maturation (Sherar, Cumming, Eisenmann, Baxter-Jones, & Malina, in press). For example, the initial appearance of secondary sex characteristics in girls may be more closely related to disengagement from physical activity than age at peak height velocity and/or menarche, both of which are late events in puberty.

The 'Mediated Effects Model of Psychological and Behavioural Adaptation to Puberty' (Petersen & Taylor, 1980) affords an appropriate conceptual framework from which to examine relations between biological maturation and physical activity in youth. The model holds that the effects of maturation on psychological and behavioural development are mediated by psychological variables and moderated by exogenous or contextual factors. Applied to the context of physical activity, psychological variables such as beliefs and attitudes pertaining to physical activity or the self would be predicted to mediate the relation between maturity status and physical activity. Moderating factors would include variables external to the person, such as cultural ideals, social agents or the environment.

Physical self-concept has been advanced as a potential mediator of relations between maturity status and physical activity (Malina, 2008; Monsma, Malina, & Feltz, 2006). This construct represents a person's perceptions of the self as formed through experience with and interpretations of his or her environment related to the physical domain (Shavelson, Hubner, & Stanton, 1976). Physical self-concept is considered to be a determinant and outcome of physical activity (Weiss & Chaumeton, 1992), with positive self-concept predicting greater involvement in moderate-to-vigorous forms of physical activity, and physical activity begetting more positive self-concept (Sabiston & Crocker, 2008). Evidence linking physical self-concept to maturity status is, however, limited and restricted to females. Employing the Children and Youth Physical Self-Perceptions Profile (CY-PSPP; Whitehead, 1995), past work has found advanced maturation to be associated with lower perceptions of the physical self-worth (Davison et al., 2007; Niven et al., 2007), body attractiveness (Niven et al., 2007), and to a lesser extent sport competence (Craft, Pfeiffer, & Pivarnik, 2003).

Although researchers have examined relations among maturation, physical self-concept and physical activity, to date, no research has examined the potential mediating role of physical self-concept on relations between maturation and physical activity. Thus, the purpose of this study was to test a mediated effects model (cf (MacKinnon, Lockwood, & Williams, 2004)) (Fig. 1) describing the potential mediating role of physical self-concept on relations between maturity status and physical activity in adolescent girls. In accordance with the Mediated Effects Model of Psychological and Behavioural Adaptation to Puberty (Petersen & Taylor, 1980) and extant literature pertaining to the biological and psycho-behavioural correlates of growth and maturation (Davison et al., 2007; Malina et al., 2004; Niven et al., 2007), the model hypothesized that (i) advanced maturation in girls would predict lower perceptions of sport competence, body attractiveness and physical condition, but higher perceptions of strength; (ii) perceptions of sport competence, body attractiveness, physical condition and strength would, in turn, positively predict physical self-worth; (iii) physical self-worth would positively predict involvement in physical activity; and (iv) biological maturity status would indirectly predict variance in both physical self-worth and physical activity.