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Biological maturation and physical activity in adolescent British females: The roles of physical self-concept and perceived parental support

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ABSTRACT

Objectives: This study examined the mediating and moderating effects of physical self-concept and parental support, respectively, on relations between maturation and physical activity (PA) in British adolescent females.
Design: Cross-sectional field based study.
Methods: Biological maturity status, physical self-concept, perceived parental support for PA, and self-reported PA were assessed in 244 female British year 7–9 pupils (M age = 12.8 years, SD = .9).
Results: Structural equation modelling, employing maximum likelihood estimation and boot-strapping procedures supported the contention that physical self-concept mediated an inverse relation between maturation and PA. A regression model examining the main and interactive effects of maturation and parental support on PA provided evidence of a main effect for parental support, but no interactive effect.
Conclusions: The results suggest that physical self-concept partially mediates an inverse relation between maturity and physical activity in adolescent females. Accordingly, how adolescent females interpret or perceive the changes associated with maturation may be more important than maturation itself. Encouraging adolescent females to view puberty as a natural and attractive aspect of the process of 'growing up' may help mitigate any negative health consequences associated with early maturation. Parental support for PA does not appear to moderate relations between maturation and PA.

Regular involvement in physical activity (PA) is a prerequisite for healthy physical and psychological development (Malina, 2008). Individuals who regularly engage in moderate-to-vigorous intensity bouts of PA demonstrate improved functional capacity and are at lower risk for numerous degenerative diseases and psychological disorders (e.g., hypertension, type II diabetes, coronary heart disease, depression & anxiety). To attain the health benefits of PA, individuals should be encouraged to be, and remain, active from an early age. Children have, however, become less active in many PA domains, including physical education, active transport, and leisure-time activities (Dollman, Norton, & Norton, 2005).

A true understanding of PA in youth resides in the independent and interactive effects of biological, psychosocial, and environmental factors (Eisenmann & Wickel, 2009). Whereas the contributions of psychological and environmental factors are well documented, the influence of biological factors has received less attention. A biological factor relevant to PA in youth is maturation. Biological maturation entails progression towards adulthood and can be considered in terms of tempo and/or timing (Malina, Bouchard, & Bar-Or, 2004). Tempo refers to the rate at which maturation progresses, whereas timing refers to the time that maturity-related events occur relative to same age peers (e.g., age-at-menarche or peak height velocity). Children of the same chronological age can vary considerably in maturity, with some maturing earlier or later than others.

The timing of biological maturation may contribute to PA in adolescence, particularly in females where marked declines in PA and increases in sedentary behaviours coincide with the onset of puberty (Sallis, 2000). An inverse relation between maturity timing and PA is predicted in adolescent females. The physical and functional characteristics associated with advanced maturation in girls

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(i.e., greater pubertal gains in height, weight, weight-for-height, and absolute and proportional fat-mass) are less conducive to successful engagement in PA (Sherar, Cumming, Eisenmann, Baxter-Jones, & Malina, 2010), especially in activities that emphasise weight bearing, endurance, and/or aesthetic qualities (e.g., diving, gymnastics, figure skating). Early maturing girls also socialize with older peers groups (Caspi & Moffitt, 1991), who by their nature, are less active. Conversely, late maturing girls socialize with younger and more active peers, and possess physiques that are more suited to successful engagement in PA and more consistent with western ideals pertaining to attractiveness (i.e., more linear physique, less absolute and proportional fat-mass).

Studies of maturity timing and PA in adolescent females have produced equivocal results (Sherar et al., 2010). Whereas some studies have shown late maturing females to be more active than early maturing females (Davison, Werder, Trost, Baker, & Birch, 2007; Riddoch et al., 2007), an equivalent number of studies have observed no relation between maturity timing and PA (Niven, Fawkner, Knowles, & Stephenson, 2007; Wickel & Eisenmann, 2007). That said, only one study, found early maturing girls to be more active (van Jaarsveld, Fidler, Simon, & Wardle, 2007). The inconsistent nature of these findings has been attributed to the failure to consider moderating and mediating factors (Sherar et al., 2010).

To better understand relations between maturation and PA in adolescence, Cumming, Sherar, et al. (2011) proposed a Biocultural Model of Maturity-associated Variance in Adolescent PA. In line with existing models of pubertal and adolescent development (Holmbeck, 2002; Petersen & Taylor, 1980), the Biocultural Model holds that maturation exerts both direct and indirect (i.e., mediated & moderated) effects on PA. Mediating variables include beliefs, fantasies and/or attitudes towards maturation, the body, or PA; whereas moderating factors include peer acceptance, parental support, motivational climate, and cultural values and standards pertaining to the body, maturation and PA.

A central tenet of the Biocultural Model is that the physical and functional changes associated with puberty hold significant stimulus value, influencing adolescents' self perceptions and the perceptions and reactions of others. From this perspective, it is not so much the physical and functional changes associated with puberty that influence adolescent engagement in PA, but the manner in which the changes are interpreted and the meaning and value that is ascribed to them (Cumming, Sherar, et al., 2011; Petersen & Taylor, 1980). In line with this reasoning, individual differences in the activity of early maturing girls are attributed to differences in the interpretation and social management of puberty. That is, early maturing girls who perceive pubertal change as normal and attractive consequence of the maturation process (and not as a barrier to activity) and/or experience an environment that is supportive and accepting of change (i.e., autonomy supportive, mastery involving, or body image friendly) are considered to be more likely to remain active through adolescence.

Evidence suggests that perceptions of the physical-self mediate an inverse relation between maturation and PA in adolescent girls. In separate samples of adolescent British females, Cumming, Standage, et al. (2011) and Hunter Smart et al. (2012) tested a series of mediated effects models explaining maturity associated variance in PA. Structural equation modelling, employing bootstrapping procedures, provided strong support for the models and evidence of mediation effects. In each study, advanced maturation predicted lower physical self-concept, which, in turn, predicted less involvement in PA. Maturation and physical self-concept were most closely associated with perceptions of attractiveness and, to a lesser extent, sports competence. Early maturing girls reported lower attractiveness and sports competence, which, in turn, predicted a more negative self-concept and less involvement in PA. The issues of attractiveness and self-presentation are considered to play central roles in the psycho-behavioural adjustment of adolescent females and, to a lesser extent, males (Summers-Efler, 2004). The need to feel and demonstrate competence has also been identified as a key predictor of motivated behaviour and well-being in a number of contemporary theories of motivation, including Harter's Competence Motivation Theory (Harter, 1981) and, more recently, Self-determination Theory (Ryan & Deci, 2000).

Parental support for PA may serve as a moderator of relations between maturation and PA in adolescent females. It consists of a variety of behaviours including encouragement, role modelling, logistical support, and active engagement, expressing interest, and/or watching/spectating, and has been shown to predict adolescent involvement in PA. Mrug et al. (2008) observed that early maturing girls who experienced positive parenting were less susceptible to engagement in delinquent behaviours. In a similar fashion, parental support for PA may mitigate any negative effects of early maturation on PA.

A limited number of studies have examined the impact of parental support on relations between maturation and PA. The main and interactive effects of parental support and maturation on moderate-to-vigorous intensity PA (MVPA) were examined in 801 participants in the NICHD Study of Early Child Care and Youth Development (Bradley, McRitchie, Houts, Nader, & O'Brien, 2011). Though pubertal timing was unrelated to MVPA in both males and females, parental support moderated the effect of pubertal timing on MVPA in males, but not females. Specifically, high parental monitoring predicted lower activity levels for late maturing, but greater activity levels for early maturing males. In a study of early breast development in adolescent girls, Summers-Efler (2004) noted that high levels of parental acceptance and support predicted continued involvement in PA through adolescence. This observation, amongst others, led Summers-Efler to contend that parental support played a central role in the prevention and development of defensive or maladaptive coping strategies and the internalization of negative messages in early maturing girls.

In light of Sherar et al.'s (2010) recommendation to consider variables that might mediate or moderate relations between maturation and PA, the purpose of this study was to examine the extent to which physical self-concept and perceptions of parental support for PA mediated and moderated, respectively, relations between maturation and PA in adolescent females. Consistent with previous research, it was predicted that physical self-concept would mediate an indirect inverse relation between maturation and PA. Further, it was predicted that perceptions of parental support for PA would moderate relations between maturation and PA. That is, high levels of perceived parental support would mitigate any negative effects associated with advanced maturation on PA.

Method

Participants

Participants were 244 female Year 7 through 9 pupils from a single-sex Catholic Comprehensive State School in England (M age = 12.8, SD = .9 years; range = 11–14 years). The study's methods were approved by the Department for Health's research ethics committee. Written consent was obtained from the Head Teacher, who acted in *loco parentis*. Parents were informed of the research by post and asked to provide passive consent (i.e., contact the school/researchers if they *did not* wish their child to take part). Verbal consent was obtained from pupils.