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Estimated maturity status and perceptions of adult autonomy support in youth soccer players

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Abstract

In this study, we examined the relations between biological maturity status, body mass index, age, and perceptions of adult autonomy support in the context of youth soccer. A total of 70 female and 43 male soccer players, aged 9–15 years, completed three adult-specific versions (i.e. mother, father, coach) of the perceived autonomy support subscale from the Interpersonal Style Scale. The participants' percent predicted adult stature was used as an estimate of biological maturity status. Multiple linear regression analyses revealed that advanced maturity status in male players predicted lower perceptions of autonomy support from the coach. Maturity status was unrelated to perceptions of autonomy support from the coach in female soccer players, and paternal and maternal autonomy support in male and female players. Age and body mass index were unrelated to perceptions of adult (i.e. coach, mother, father) autonomy support in male and female players.

Keywords: *Growth, maturation, athletes, parents, football*

Introduction

The processes of growth and maturation are instrumental in the socialization of young athletes. Biological factors, such as body size and maturity status, have been documented as predictors of athlete selection and performance in several sports (Malina, Bouchard, & Bar-Or, 2004a). However, the impact of biological growth and maturation on the psychological and social development of young athletes has received relatively little attention (Kontos & Malina, 2004). The physical changes associated with growth and maturation may have a profound impact upon the self-perceptions, motives, beliefs, and, ultimately, behaviours of young athletes. Moreover, coaches, parents and administrators may react differently to children of varying body size, physique, and maturity status in the context of a specific sport. With this in mind, the purpose of the present study was to investigate relations among biological maturity status, mass for stature – as measured by the body mass index – age, and

perceptions of adult behaviours in the context of youth soccer.

The physical characteristics associated with superior performance in soccer (i.e. speed, power, and endurance) favour males who are advanced in their biological maturity status and females who are “on time” or later in their maturity status (Malina, 2003; Siegel, Katzmaryzk, & Malina, 1996). Advanced maturity in males is associated with greater height, weight, and muscle mass and with superior athletic performance, particularly in activities that require strength, speed, and power (Malina *et al.*, 2004a). Although later maturity in females is associated with smaller height and weight during puberty, it is associated with proportionally greater lean mass and superior performances in activities that involve weight bearing and endurance. Although there are limited data available on the relationship between body size/physique and performance in women's soccer (let alone girls' soccer), one would expect that gynoid as opposed to android type body types would be less mechanically efficient in sports that require an

element of endurance. During a typical match, elite female soccer players cover distances just less than 8.5 km (Brewer & Davis, 1994).

The mediated effects model of adaptation to puberty (Petersen & Taylor, 1980) provides an appropriate theoretical framework from which to examine the psychological and social significance of growth and maturation in youth soccer. This model assumes that the psychological and behavioural effects of puberty are mediated by internalized psychological factors (e.g. self-esteem, self-perceptions and evaluations, body image, beliefs, attitudes or fantasies about body development) and moderated by exogenous or contextual factors (e.g. sociocultural contexts, ideals, expectations, and practices). As such, how an individual adjusts, socially and psychologically, to the changes associated with growth and maturation is dependent upon his or her "ideation about his or her biological changes and the subjective meaning or affective significance attributed to them" (Petersen & Taylor, 1980, p.137).

A central tenet of the mediated effects model is that adults and peers play an important role in helping youth interpret and evaluate the physical changes associated with growth and maturation (Petersen & Taylor, 1980). The reactions, evaluations, ideals, and impressions conveyed by significant others (e.g. parents, teachers, peers) communicate positive or negative information regarding self-worth, physical appearance, or competency, impacting children's self-beliefs and perceptions (Harter, 1982). Adults commonly evaluate biologically early maturing males as more socially adjusted and having superior physiques and physical abilities than their "later" maturing counterparts (Jones & Bayley, 1950). However, it should be noted that these observations are based on studies that were conducted three generations ago. Little information is available on how adults rate or react to the physical characteristics or aptitude of early and late maturing female athletes, but some evidence suggests that the family environment is influential in helping females adjust psychologically and behaviourally to the physical changes associated with biological maturation (Brooks-Gunn & Ruble, 1983).

How might adults react to soccer players of varying maturity status? Intuitively, one would expect adults to act more favourably towards players who are physically better suited for the demands of the sport (i.e. early maturing males, average/late maturing females). More able athletes have greater potential for success, require less supervised instruction, and their successes reflect well upon those attached to them (e.g. coaches, parents). This contention is supported by research examining self-fulfilling prophecy theory (Rosenthal & Jacobsen, 1968) and teacher expectations in academia. Students who

teachers perceive as being more able are rated higher and are given more opportunity for autonomy and leadership, less structured or repetitive tasks, more challenging material, less criticism, and more positive support (Good & Thompson, 1998; Schultz, 1994; Weinstein, Gregory, & Strambler, 2004). A similar pattern of teacher-student interactions has been observed in physical education classes (Portman, 1995; Siedentop, Doutis, Tsangaridou, Ward, & Rauschenbach, 1995). Research examining the impact of biological factors and ability upon athlete-coach interactions, though limited, has produced equivocal results. In high school gymnastics, Cumming, Eisenmann, Smoll, Smith and Malina (2005) observed that coaches react more favourably (e.g. more frequent reinforcement, encouragement, instruction, and less frequent ignoring of mistakes) towards female gymnasts who are more physically suited for success in their sport (i.e. shorter, lighter, and a lower body mass index), even when controlling for ability and performance. In contrast, a study of coaching behaviours in middle school softball coaches found that during competition, high expectancy athletes (i.e. those athletes who the coach perceived as being most able) received less reinforcement (i.e. praise) following good performances and more punishment following performance errors than low expectancy athletes (Horn, 1984).

Consistent with the contention that adults react more favourably towards youth who are more able or better suited for success in achievement domains (Rosenthal & Jacobsen, 1968), it is predicted that youth soccer coaches and parents will interact differently with players of varying biological maturity status. Specifically, it is predicted that the estimated biological maturity status of female soccer players will be negatively associated with players' perceptions of adult autonomy support, while the estimated maturity status of male soccer players will be positively associated with perceptions of adult autonomy support. Autonomy support entails allowing an athlete to make choices and decisions regarding their participation in a sport (Vallerand *et al.*, 1987) serving to increase intrinsic motivation through gains in perceived autonomy and competence. As previously noted, educators have been shown to provide greater autonomy support to students whom they perceive as being the most able. Adult-created situations perceived by athletes as controlling (i.e. being told what to do and how to do it) may undermine intrinsic motivation, creativity, self-expression, and enjoyment (Gould, Eklund, Petlichkoff, Peterson, & Bump, 1991; Vallerand, 2001).

In addition, it is predicted that body mass index (BMI) will be positively associated with perceptions

of autonomy support in males, and negatively associated with perceptions of autonomy support in females. In children and adolescents, BMI is often used to assess whether someone is underweight, overweight, or at risk of being overweight. Children's BMI ratios change over the years as they grow. As previously indicated, BMI has been identified as an athlete selection factor in several sports, including soccer. Finally, it is predicted that adult autonomy support will be positively associated with age in male and female players. That is, players will be permitted greater autonomy as they get older.

Methods

Participants

The participants were 43 male and 70 female soccer players aged 9.0–14.8 years. All participants competed in recreational soccer programmes. The mean ages of the male and female players were 10.9 ($s = 1.5$) and 11.3 ($s = 1.6$) years, respectively. The mean number of years that the male and female participants had been playing adult-organized competitive soccer was 5.1 ($s = 1.9$) and 4.8 ($s = 1.8$), respectively. The mean number of years that the male and female players had been with their coach, including the current season, was 2.0 ($s = 1.0$) and 1.7 ($s = 0.9$), respectively. Mean values for years playing competitive soccer and years playing with coach are presented, by age group and sex, in Table I. Parental consent and child assent were obtained before the research was conducted. The study was approved by the University Committee on Research Involving Human Subjects.

Maturity status

The stature and body mass of the participants were measured using standardized procedures (cf. Malina, 1995). The inter- and intra-observer technical errors of measurement for stature were 0.20 cm and 0.16 cm, respectively.

Percent predicted mature (adult) stature was used as a non-invasive estimate of biological maturity status. This method assumes that an individual who is closer to his or her predicted adult stature than expected for age is advanced in maturity status, whereas an individual who is below his or her predicted adult stature than expected for age is later in maturity status (Malina *et al.*, 2004a). For example, the mean percentage of adult stature attained by girls in the Berkeley Guidance Study at the age of 12.0 years was 92.6% (Bayer & Bayley, 1959). A girl who has attained 95% of her predicted adult stature at 12 years would be considered early, whereas a girl who has attained 89% of her predicted adult stature would be considered late.

The Khamis-Roche (Khamis & Roche, 1994, 1995) method was used to predict adult stature from current age, stature, and weight of the youngster and mid-parent stature (average height of biological parents). The median error bound (median absolute deviation) between actual and predicted mature height at 18 years of age was 2.2 cm in males and 1.7 cm in females (Khamis & Roche, 1994). Biological parents of the players reported their statures. As adults tend to overestimate stature (Epstein, Valoski, Kalarchian, & McCurley, 1995), the self-reported stature of each parent was adjusted for overestimation using an equation constructed from over 1000 measured and estimated heights of adults (Epstein *et al.*, 1995).

Estimated maturity status was expressed as a z -score, using the percentage of predicted adult height attained at the time of measurement, and half-yearly age- and sex-specific means and standard deviations from the Berkeley Guidance Study (Bayer & Bayley, 1959). This reference sample was selected for four reasons:

1. The mean heights and weights of boys and girls aged 9–15 years in the guidance sample are similar to current US reference values (<http://www.cdc.gov/growthcharts>).

Table I. Descriptive statistics for experience playing soccer and perceived adult autonomy support by age group and sex (mean \pm s).

Age group (years)	Years playing soccer	Years with coach	Perceived autonomy support – coach	Perceived autonomy support – mother	Perceived autonomy support – father
Males					
9–11 ($n = 27$)	4.2 \pm 1.1	2.2 \pm 1.3	4.67 \pm 1.5	5.58 \pm 1.4	5.87 \pm 1.2
11–13 ($n = 11$)	6.1 \pm 1.3	2.7 \pm 1.8	5.27 \pm 0.6	6.20 \pm 1.1	6.27 \pm 0.8
13–15 ($n = 5$)	8.2 \pm 2.2	2.7 \pm 1.9	4.10 \pm 1.8	5.83 \pm 0.8	5.23 \pm 1.9
Females					
9–11 ($n = 36$)	3.7 \pm 1.3	2.7 \pm 1.0	4.31 \pm 1.6	5.90 \pm 0.9	6.11 \pm 0.8
11–13 ($n = 20$)	5.5 \pm 1.7	2.8 \pm 1.4	4.96 \pm 1.1	5.98 \pm 0.7	6.26 \pm 0.5
13–15 ($n = 14$)	6.5 \pm 1.4	3.1 \pm 2.6	5.58 \pm 0.7	5.27 \pm 1.4	6.12 \pm 0.7

2. The means and standard deviations in the guidance sample are reported at half-year intervals.
3. The Khamis-Roche method for predicting adult stature uses the same half-year age intervals as the Guidance study sample.
4. The mean percentages of predicted adult stature attained at all whole years (e.g. 11.0 years, 12.0 years) are very similar to those in a more recent sample (Fels Longitudinal Study; Khamis & Roche, 1994, 1995).

The maturity status of each player can be classified on the basis of their z -score for percentage of mature height attained at measurement: z -scores between -1.0 and $+1.0$ = average or “on time”; a z -score below -1.0 = late or delayed; a z -score above $+1.0$ = early or advanced (Malina & Cumming, 2003; Malina *et al.*, 2005b). This procedure is similar to that in previous studies that used differences between skeletal and chronological ages to classify youth into maturity categories (Malina *et al.*, 2004a).

Perceived adult autonomy support scales

Three adult-specific versions of the perceived autonomy support subscale from the Interpersonal Style Scale (ISS) were employed. These subscales assessed the athletes’ perceptions of autonomy support provided by their mother, father, and coach, respectively. Completion of each subscale required the participants to respond on a 7-point Likert scale (1 = “never”, 7 = “always”) to a series of six items that asked how frequently their fathers, mothers, or coaches exhibited certain autonomy supportive behaviours. Variations of the ISS have been employed successfully with children as young as 13 years [Interpersonal Behavior Scale (IBS): Pelletier, Fortier, Vallerand, & Briere, 2001; Coach’s Interpersonal Style (CIS): Pelletier *et al.*, 1995]. More recent studies suggest that children as young as 7 years can respond accurately to similar measures of perceived adult (parent and coach) autonomy support (Gagne, Ryan, & Bargmann, 2003). Variations of the ISS autonomy support subscale have previously demonstrated acceptable reliability [CIS: Cronbach’s $\alpha = 0.76$ (Pelletier *et al.*, 1995); IBS: Cronbach’s $\alpha = 0.81$ (Pelletier *et al.*, 2001)] and psychometric integrity. Internal reliability in the current sample was also acceptable (Perceived Autonomy Support from Mother, Cronbach’s $\alpha = 0.78$; Perceived Autonomy Support from Father, Cronbach’s $\alpha = 0.86$; Perceived Autonomy Support from Coach, Cronbach’s $\alpha = 0.84$). Mean values of perceived autonomy support from coach, mother, and father are presented, by sex and age group,

in Table I. Although perceived autonomy support did not appear to vary with age or sex, athletes appeared to perceive more autonomy support from their parents than their coach.

Statistical analyses

Descriptive statistics were calculated for age, estimated maturity status, stature, body mass, and BMI and are presented, by sex and age group, in Table II. Multiple linear regression analyses were conducted to examine the associations between maturity status, age, BMI, and perceived adult autonomy support. Separate analyses were conducted for males and females. Stature and body mass were excluded from the regressions as these variables are highly correlated with age, BMI, and one another. High levels of collinearity can result in enlarged standard errors associated with the regression parameters making it difficult to achieve significance and interpret results. The results of the regressions analyses are presented in Tables III, IV, & V.

Results

The biological variables demonstrated a relatively normal distribution in both males and females (skewness statistics < 1.25). The mean biological maturity z -score was positive in two of the three age groups for male players and increased with each age group. The mean biological maturity z -score was negative in two of the three female age groups, but showed no trend relative to age groups. The mean values for stature, body mass, and BMI of male soccer players fell between the 50th and 75th centiles in most age groups, when compared against US reference data (Ogden *et al.*, 2002; <http://www.cdc.gov/growthcharts>). The mean BMI of the males in the 13–15 year age group approximated the 85th centile. Although the BMI values of male youth soccer players are typically higher in older age groups, it is important to note that this value may have been inflated by the relatively small number of participants in the 13–15 year age group. The mean values for stature, mass, and BMI of the female soccer players also fell between the 50th and 75th centiles in the majority of the age groups, when compared against US reference medians. The mean value for BMI only exceeded the 75th centile for the reference population in the 13–15 year age group.

Estimated maturity status, age, BMI, and perceptions of adult autonomy support

The regression equations were significant for male and female players’ perceptions of autonomy support from the coach, predicting 18% and 15% of the

Table II. Descriptive statistics for age, estimated maturity status, stature, body mass, and BMI, by sex and competitive age group.

Age group (years)	Age (years)	Maturity status (<i>z</i> -score)	Stature (cm)	Body mass (kg)	BMI (kg · m ⁻²)
Males					
9–11 (<i>n</i> = 27)	10.0 ± 0.5	-0.03 ± 0.86	139.2 ± 5.7	35.6 ± 6.1	18.3 ± 2.5
11–13 (<i>n</i> = 11)	11.6 ± 0.5	0.26 ± 0.45	151.0 ± 5.9	44.6 ± 7.8	19.5 ± 3.2
13–15 (<i>n</i> = 5)	14.1 ± 0.5	0.69 ± 0.26	167.0 ± 9.8	64.1 ± 9.6	23.0 ± 2.3
Females					
9–11 (<i>n</i> = 36)	10.0 ± 0.4	-0.18 ± 0.82	141.5 ± 6.0	36.0 ± 5.6	18.0 ± 2.3
11–13 (<i>n</i> = 20)	12.0 ± 0.5	0.37 ± 0.96	151.0 ± 6.9	43.1 ± 9.3	18.9 ± 3.6
13–15 (<i>n</i> = 14)	13.8 ± 0.5	0.06 ± 0.65	162.1 ± 4.9	58.1 ± 9.2	22.0 ± 2.5

Table III. Summary of regression analyses for variables predicting perceived autonomy support from the coach.

Variable	Males (<i>n</i> = 43)			Females (<i>n</i> = 70)		
	<i>B</i>	<i>SE B</i>	β	<i>B</i>	<i>SE B</i>	β
Maturity status	-0.59	0.39	-1.11**	-0.23	0.28	-0.39
Age	-0.10	0.15	-0.10	0.26	0.13	0.23
BMI	0.36	0.10	0.17	0.21	0.08	0.09
<i>R</i> ²	0.18			0.15		
<i>F</i>	2.89*			3.65*		

P* < 0.05; *P* < 0.01.

Table IV. Summary of regression analyses for variables predicting perceived autonomy support from the father.

Variable	Males (<i>n</i> = 43)			Females (<i>n</i> = 70)		
	<i>B</i>	<i>SE B</i>	β	<i>B</i>	<i>SE B</i>	β
Maturity status	-0.08	0.39	-0.14	0.02	0.21	0.03
Age	0.17	0.16	0.16	-0.20	0.09	-0.12
BMI	0.03	0.10	0.01	-0.06	0.06	-0.12
<i>R</i> ²	0.03			0.05		
<i>F</i>	0.41			0.96		

P* < 0.05; *P* < 0.01.

Table V. Summary of regression analyses for variables predicting perceived autonomy support from the mother.

Variable	Males (<i>n</i> = 43)			Females (<i>n</i> = 70)		
	<i>B</i>	<i>SE B</i>	β	<i>B</i>	<i>SE B</i>	β
Maturity status	-0.02	0.38	-0.03	-0.10	0.15	-0.08
Age	-0.12	0.15	-0.10	-0.07	0.07	-0.03
BMI	0.07	0.10	0.03	0.26	0.04	0.06
<i>R</i> ²	0.01			0.03		
<i>F</i>	0.25			0.73		

P* < 0.05; *P* < 0.01.

variance, respectively (Table III). Results of the univariate tests and standardized beta weights revealed that, for males, the only significant predictor

of perceived autonomy support from the coach was maturity status. Contrary to expectations, advanced maturity status was associated with lower perceptions of autonomy support. None of the variables predicting the female players' perceptions of autonomy support from the coach achieved significance. Tables IV and V show that the regression equations, for male and female players, failed to explain significant amounts of the variance in perceptions of autonomy support from the mother or the father.

Discussion

To our knowledge, this is the first study to examine relations between biological maturity status and athletes' perceptions of adult behaviours. Male soccer players in the current study can be classified as being average-to-advanced in estimated biological maturity status. The mean biological maturity *z*-score for male soccer players was positive in two of three competitive age groups and increased with each age group. For male soccer players, the mean values for stature, body mass, and BMI fell between the 50th and 75th centiles in most age groups, when compared against US reference data (Ogden *et al.*, 2002). However, the mean BMI value of the males in the 13–15 year age group approximated the 85th centile. These results are consistent with previous research (Malina, 2003) and suggest that male soccer players, even in programmes that are not affiliated with professional clubs or national squads, tend to be slightly advanced in maturity status. As previously noted, advanced maturation in males is associated, on average, with greater height and mass, a higher BMI, and a larger muscle mass (Malina *et al.*, 2004a). These characteristics are positively associated with strength, power, and speed and may afford an advantage in soccer.

The female soccer players tended to be average or slightly delayed in estimated maturity status. There were, however, no trends across the three competitive age groups. For female players, the mean values for stature, mass, and BMI fell between the 50th and 75th centiles in the majority of the age groups, when

compared against US reference medians. The mean BMI only exceeded the 75th centile for the reference population in the 13–15 year age group. On the whole, these results are consistent with previous research on female athletes (Malina *et al.*, 2004a). Later or average maturation in females is generally associated with better achievements on several performance tasks, particularly those associated with weight bearing or cardiovascular endurance.

The observed relation between maturity status and perceptions of autonomy support from the coach, in male soccer players, is of special interest. Contrary to expectations, advanced maturity status in male players was associated with lower perceptions of autonomy support from the coach. This result suggests that males who are more advanced in biological maturity status experience a socio-psychological environment that is less conducive for their continued involvement in the sport. It is important to note, however, that the percentage of variance in perceived autonomy support explained by the regression model was relatively small. There are many additional factors that may operate to influence autonomy support in coaches, such as standard of competition, player achievement, pressure to succeed, and expectations for success. Future studies should seek to control for such factors. Finally, it is also important to recognize that the mean scores for perceptions of autonomy support from the coach in male players were moderately high (mean = 4.76, $s = 1.42$).

There are several reasons why soccer coaches might adopt less autonomous styles of interaction when dealing with male players who are advanced in their maturity status. First, the coach may feel greater pressure for such athletes to succeed (Kontos & Malina, 2004). Pressure can come from a variety of sources, including competition, pride, and personal or social expectations. Adults who feel greater pressures for their children/athletes to succeed in sports are less likely to adopt autonomy supportive styles of interaction (Vallerand *et al.*, 1987). The coaches may also believe that athletes who are physically better suited for success are more likely to possess extrinsic motives for playing soccer, particularly those associated with high ability (e.g. winning, trophies/awards, social recognition, scholarships). Adults who perceive youngsters as being more extrinsically motivated are also less likely to engage in autonomy supportive styles of interaction (Pelletier *et al.*, 1995; Vallerand *et al.*, 1987).

The estimated maturity status of the female players was unrelated to perceptions of autonomy support from their coaches. The physical and functional characteristics associated with variation in maturity status may hold more significance for coaches of male soccer players than it does for those of female

players. Maturity status (stage of sexual maturity) has been shown to have a positive influence on three measures of functional capacity in adolescent male soccer players aged 13–15 years: intermittent shuttle run (endurance), 30-m dash (speed), and vertical jump (power). Stage of sexual maturity and years of training were the primary contributor to variance in the intermittent shuttle run, whereas weight and height, together with stage of sexual maturity, were the primary contributors to the explained variance in the 30-m dash and vertical jump, respectively (Malina, Eisenmann, Cumming, Ribeiro, & Aroso, 2004b). In contrast to functional capacity, age, years of experience in football, body size, and sexual maturity status contributed relatively little to variation in performance on soccer-specific skill tests (Malina *et al.*, 2005a). This finding comes as no surprise. Skill is more difficult to measure than functional indicators such as speed and power. Many factors other than body size and maturity status (e.g. neural control of movement and perceptual-cognitive skills such as anticipation and visual search strategies) influence performances on sport-specific skill tests. Maturation of neural control and perceptual-cognitive skills during adolescence is another source of variation (Malina & Cumming, 2004).

Information on the relationships between maturity status, functional capacities, and soccer-specific skills in adolescent female players is not presently available. Differences between the sexes in the nature of competitive play could, however, reduce or minimize potential maturity-associated variation in soccer performance. This idea is suggested by information on the physiological attributes of female soccer players: “female soccer players are more predisposed to a style of play that entails the patient sequencing of passing, rather than one based on high rates of physical work” (Brewer & Davis, 1994, p. 98). As a result, the coaches of female soccer players may place greater value on player attributes such as skill and tactical awareness than on physical characteristics.

The results of the current study present what appears to be a theoretical incongruity. Autonomy support on behalf of the coach is generally assumed to foster intrinsic motivation, perceptions of competence, and continued involvement in sports (Vallerand, 2001). In the present study, however, the male players who were most likely to continue their involvement in soccer (i.e. early maturers) perceived the least autonomy support. Differences in how players interpret coaching behaviours could explain this apparent inconsistency. Cognitive evaluation theory (Deci & Ryan, 1985) posits that the impact of the competitive environment upon players’ motives is mediated by the athletes’ perceptions of the environment as controlling or informational. Players who are advanced in maturity status may be

more inclined to interpret seemingly non-autonomy supportive behaviours as informational (i.e. indicative of higher ability/potential) rather than controlling. Although beyond the scope of the measurement tool used in the present study, future work would do well to try and tease out whether this seeming departure from theory (Deci & Ryan, 1985) is attributable to differences in perceptions of the social context commensurate with maturation status.

Estimated biological maturity status was unrelated to perceptions of paternal and maternal autonomy support in male and female soccer players. The physical and functional characteristics associated with biological maturation may hold little or no social stimulus value for the parents of soccer players. Moreover, parents may be less aware of relations between maturity status and performance in soccer than are coaches. Parents are primarily providers of emotional and provisional support for children (Rowley, 1986); they are not ordinarily involved in technical instruction or conditioning.

Administrators and coaches of youth soccer programmes often have limited understanding of the processes of growth and maturation and the impact of maturity-associated variation on size, physique, functional capacities, and behaviours. Coach education programmes can contribute to better understanding of these processes and their potential interactions with sport-specific functional capacities, skills, and behaviours. Coaches, particularly those instructing males, need to be aware that they may need to act differently towards athletes of differing maturity status or ability. Coaches should also be aware of the motivational and behavioural consequences associated with less autonomy-supportive styles of interaction. Several advantages and disadvantages associated with more authoritarian styles of management in soccer have been identified (Cook, 1996). Coaches that adopt authoritarian styles of management typically plan and prepare players well for competition and have teams that are mentally and physically tough, determined, and well disciplined (Cook, 1996). These benefits, however, are dependent upon the success of the team and the integrity of the coach. When a team is on a losing streak, authoritarian styles of management are more likely to result in a loss of team morale and discipline. Similarly, if the coach demonstrates a lack of sportsmanship or does not practise what he or she preaches, he or she can quickly lose the respect of players. Moreover, less autonomy supportive styles of interaction are associated with less intrinsic motivation, creativity, self-expression, and enjoyment (Deci & Ryan, 1985; Vallerand, 2001).

It is important to recognize several limitations associated with the current study. First, this is a preliminary attempt to examine the relations between

biological maturity status and perceptions of adult behaviour in youth sports. Further research is required to validate the results of this study as well as the non-invasive method used to estimate biological maturity status. Second, the participants in the current investigation represented a select sample of the population. The nature and magnitude of the relations between estimated maturity status and perceptions of adult autonomy support may vary with age, sport, and standard of competition, as well as with socioeconomic status and ethnicity. Cultural and social norms have been shown to mediate psychological and behavioural accommodations to the morphological changes during puberty (Duncan, Ritter, Dornbusch, Gross, & Carlsmith, 1985).

Another limitation of the current study is the fact that the sample was relatively heterogeneous in its nature, with the age-span covering 9.0–14.8 years. Maturity-associated variation in physique and physical aptitude is most evident between the ages of 11 and 14 years in females and 13 and 16 years in males (Malina *et al.*, 2004a). It is possible that the social significance of maturity status may have its greatest impact during these periods. In future, researchers may wish to focus upon youth in these age groups. Maturity status may have little or no social significance below these age ranges. The physical and functional demands associated with different sports and different standards of competition could also influence the nature of these relationships. Finally, it is important to recognize that the current study assessed the soccer players' perceptions of adult behaviour and not actual adult behaviour *per se*. In future, researchers should employ objective measures of adult behaviour (e.g. Coach Behaviour Assessment System; Smith, Smoll, & Hunt, 1977) in addition to assessing athletes' perceptions of adult behaviour.

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