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Characteristics of youth soccer players who drop out, persist or move up

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Abstract

In this study, we compared the growth, maturity status, functional capacity, sport-specific skill, and goal orientation of 159 male soccer players, aged 11–12 ($n = 87$) and 13–14 years ($n = 72$) years, who at follow-up 2 years later discontinued participation (dropout), continued at the same standard (club) or moved to a higher level (elite). Age group-specific multivariate analysis of variance was used for comparisons. Among 11- to 12-year-old players at baseline, a gradient of elite > club > dropout was suggested for size and function, although differences were not consistently significant. Elite players performed significantly better in only two of the four skills, dribbling and ball control. A gradient of elite > club > dropout was more clearly defined among 13- to 14-year-old players at baseline. Elite players were older chronologically and skeletally, larger in body size and performed better in functional capacities and three skill tests than club players and dropouts. Baseline task and ego orientation did not differ among dropouts and club and elite players at follow-up in either age group. The results suggest an important role for growth and maturity status, functional capacities, and sport-specific skills as factors in attrition, persistence, and moving up in youth soccer.

Keywords: *Growth, bone age, fitness, attrition, goal orientation, sport selection*

Introduction

Continuation and discontinuation of participation are central to discussions of youth sports, although the latter generally receives more attention. Discontinuation is commonly included under ''drop-out'', attrition or withdrawal from youth sports in general and not from specific sports (Burton, 1988; Gould, 1987; Petlichkoff, 1996). Developmental differences are implicated in attrition but not specified (Petlichkoff, 1996). Inter-individual variation in growth, maturation, functional capacities, and sport-specific skills are not ordinarily considered in discussions of attrition. Interests of youth change as they pass from childhood into and through adolescence so that moving from one sport into another sport or activity is common (Malina, 2002, 2007). In contrast, scant attention is given to moving up or to a higher level in a sport (Hergenroeder, 1998; Kontos & Malina, 2003; Malina & Beunen, 1996).

A variety of biological and behavioural characteristics are deemed essential for success in soccer: size, physique, and body composition; aerobic and anaerobic capacity; speed, agility, and power; sport-specific skills related to ball control, passing, and shooting; perceptual-cognitive skills related to anticipation and visual searching among others; psychological skills related to motivation, cooperation, coping, and attention; and a sense of the game, labelled ''game intelligence'' (Williams & Reilly, 2000). Of relevance to those working with young athletes, many of these characteristics change with physical growth, biological maturation, and behavioural development, as well as their interactions, as young players pass into and through puberty and adolescence; moreover, inter-individual differences are considerable (Malina, Bouchard, & Bar-Or, 2004). Although soccer clubs routinely monitor progress in physical, physiological, skill, and behavioural characteristics of young players, potentially unique features of youth who have withdrawn from the sport (voluntarily or involuntarily), and who have persisted or moved to a higher level within the sport, have not been systematically reported.

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Selected characteristics of elite and non-elite youth players (Hansen, Bangsbo, Twisk, & Klausen, 1999a; Hansen, Klausen, Bangsbo, & Muller, 1999b; Reilly, Williams, Nevill, & Franks, 2000), and of youth players classified by level of skill (Malina, Ribeiro, Aroso, & Cumming, 2007b) and by national team status (Malina et al., 2000), have been reported. Studies tend to focus on older adolescent players with limited information for youth in the transition from late childhood into early adolescence.

The purpose of this study was to compare the baseline physical growth and biological maturity status, functional capacities, sport-specific skills, and goal orientation of youth soccer players who subsequently discontinued participation in the sport (drop-out), continued to participate at the same level (club) or moved to a higher playing standard (elite). Soccer players in two competitive age groups were studied in detail at 11–12 years and 13–14 years of age; participation status was evaluated 2 years later. The two age groups, in general, encompass the transition into adolescence and the interval of the growth spurt, respectively.

Methods

Participants

The sample included 159 males aged 11.0–14.9 years from five soccer clubs in the Portuguese midlands, a region more or less midway between Lisbon and Oporto. All players were born in 1989 through 1992, and were studied in 2003. Accordingly, 87 players born in 1991 and 1992 were 11.0–12.9 years and labelled as *infantiles* in the organizational structure of soccer of the Federação Portuguesa de Futebol. The remaining 72 players, born in 1989 and 1990, were aged 13.1–15.3 years at the time of study and labelled as *initiates* in the organizational structure. Teams participated in a 9-month competitive season (September–May) through the Federation. Players participated in three training sessions per week ($\sim$90 min) and one game per week, usually on a Saturday. All coaches were accredited by the Federation to direct training programmes at the respective age levels. It is reasonable to assume that the level and volume of training was appropriate for stage of development of the young players and relatively uniform across clubs. The Federation also requires clubs to record the training history of players.

The study was approved by the Scientific Committee of the University of Coimbra and each club. Athletes and their parents provided informed consent. The players were also informed that participation was voluntary and that they could withdraw at any time.

Protocol

All data were collected within a 2-week period in 2003 under standard conditions in an indoor facility at the University of Coimbra. Baseline data included age, maturity, years of training, anthropometric assessment, functional capacities, soccer skills, and goal orientation. With the exception of perceptual-cognitive characteristics and ''game intelligence'', the dependent variables are regarded as components of soccer talent (Williams & Reilly, 2000). Specific protocols and quality control for all measurements have been reported in more detail (Figueiredo, Gonçalves , Coelho e Silva, & Malina, 2009).

Age and skeletal maturity. Chronological age was calculated as the difference between date of birth and date on which a radiograph of the left hand–wrist was taken. The radiographs were assessed with the Fels method (Roche, Chumlea, & Thissen, 1988) to estimate skeletal age. The method uses specific criteria for each bone and ratios of linear measurements of epiphyseal and metaphyseal widths. Ratings are entered into a computer program (Felshw 1.0 Software) that yields a skeletal age and standard error of estimate. Radiographs were assessed by a single observer.

Skeletal age corresponds to the level of skeletal maturity attained by the player relative to the reference sample. It has limited utility by itself and is expressed relative to chronological age. Players were classified as late, average or early maturing:

- *Late for chronological age* (delayed), skeletal age younger than chronological age by >1.0 year.
- *Average for chronological age* (on time), skeletal age within ± 1.0 year of chronological age.
- *Early for chronological age* (advanced), skeletal age older than chronological age by >1.0 year.

The criteria are consistent with previous studies of young athletes (Malina et al., 2004).

Sexual maturity. Stage of pubic hair (Tanner, 1962) was assessed at clinical examination by a trained physician.

Anthropometry. Weight, height, sitting height, and skinfolds (triceps, subscapular, suprailiac, medial calf) were measured by a single trained observer following Lohman and colleagues (Lohman, Roche, & Martorell, 1988). Leg (subischial) length was estimated as height minus sitting height. The sitting

height/standing height ratio was calculated; skinfolds were summed.

Functional capacities. Aerobic performance was measured with the Yo-Yo intermittent endurance test–level 1, while anaerobic fitness was assessed with the 7-sprint protocol (Bangsbo, 1994; Reilly, 2001; Reilly & Doran, 2003). Agility was assessed with the 10×5 m shuttle, and explosive power was assessed with the vertical jump using the ergo-jump protocol, which includes a squat and counter-movement jump (Bosco, 1994).

Soccer skills. Four tests of soccer skill were assessed: ball control with the body, dribbling speed, shooting accuracy, and the wall pass (Federação Portuguesa de Futebol, 1986; Kirkendall, Gruber, & Johnson, 1987).

Goal orientation. A Portuguese version (Fonseca & Biddle, 1996) of the Task and Ego Orientation in Sport Questionnaire (Chi & Duda, 1995; Duda, 1989) was completed by all players. Cronbach's alphas (task, 0.76; ego, 0.85) indicated acceptable internal consistency.

Quality control. A sample of 32 players was measured and tested on a second occasion within 7 days. Intra-observer technical errors of measurement for anthropometric dimensions and coefficients of reliability for the functional capacity and soccer skill tests were calculated and are reported in Figueiredo et al. (2009). Technical errors for anthropometric dimensions compared favourably with corresponding intra- and inter-observer errors in several surveys in the USA and a variety of field surveys, including studies of young athletes (Malina, 1995), while reliability coefficients indicated moderate to high reliabilities that are adequate for group comparisons. The mean difference between skeletal age assessments of two independent assessors ($n = 20$, two of the authors) and inter-observer technical errors of measurement were small, 0.03 ± 0.04 years and 0.12 years, respectively. Replicate assessments of pubertal stage were not possible.

Training history. The number of seasons (expressed as years) of formal participation in soccer was obtained from each player and verified by club records. Valid data were reported by 75 (91%) of younger and by 68 (94%) of older players, respectively.

Player potential. The soccer potential of each player was subjectively evaluated by their respective coaches at baseline using a 5-point classification scheme, where 1 = very weak, 2 = weak, 3 = reasonable, 4 = good, and 5 = very good.

Follow-up

The total baseline sample was contacted again in 2005 to determine current status in the sport. Three groups were defined:

- *Drop-out*: players who discontinued (abandoned) soccer ($n = 36$); some, however, enrolled in other sports.
- *Club*: players who continued to practice and compete at the same club ($n = 90$).
- *Elite*: players who were selected for the regional team or by elite clubs – SL Benfica, FC Porto, and Sporting Lisbon, which have national strategies for talent identification and development ($n = 33$); transfer to another club requires the approval of both sending and receiving clubs.

Analysis

The analysis focused on baseline characteristics of drop-outs and club and elite players. Descriptive statistics were calculated. Multivariate analysis of variance (MANOVA) was used to compare chronological age, skeletal age, the difference between skeletal age and chronological age, anthropometric characteristics, functional capacities, soccer skills, and goal orientation within age groups. A separate analysis of variance (ANOVA) was performed for years of training in soccer due to lack of information for all players. Scores for ball control were logarithmically transformed. If a comparison was significant, pairwise comparisons with a Bonferroni adjustment were used to identify differences between specific pairs. Distributions of skeletal maturity status (late, on time, early), stages of pubic hair, birth quarter, and coach evaluation of player potential were summarized by player status at follow-up within the two age groups.

Results

Baseline characteristics of drop-outs, club and elite players at follow-up and the results of multivariate analyses of variance are summarized in Tables I and II for younger and older players, respectively. Among 11- to 12-year-old players, drop-outs, club and elite players did not differ significantly in chronological and skeletal ages at baseline, whereas they did differ significantly in years of training in soccer, body size, and functional capacities. Elite players at follow-up had significantly more years of soccer training and were significantly taller with longer segment lengths than club players and drop-outs; club players and drop-outs did not differ from each other. Body weight differed significantly only

Table I. Baseline chronological and skeletal ages, body size, functional capacities, sport-specific skills, and goal orientation of 11- to 12-year-old players classified as drop-outs, club level, and elite at follow-up and results of multivariate analyses of variance.

	Drop-out (D, $n=21$)		Club (C, $n=54$)		Elite (E, $n=12$)				
	Mean	*s*	Mean	*s*	Mean	*s*	*F*	*P*	*Post hoc* pairwise comparisons*
Training in soccer, years[a]	1.8	1.1	2.7	1.0	3.1	1.7	3.79	<0.05	E = C > D
Chronological age (CA), years	11.7	0.6	11.8	0.5	12.1	0.6	2.11		
Skeletal age (SA), years	11.9	1.6	11.9	1.3	12.5	1.5	1.12		
SA minus CA, years	0.2	1.8	0.1	1.3	0.5	1.4	0.33		
Weight, kg	39.5	6.4	36.5	5.0	42.4	8.3	5.72	<0.01	E > C; E = D; C = D
Height, cm	143.6	6.1	143.7	5.9	150.8	8.3	6.54	<0.01	E > C & D; C = D
Sitting height, cm	72.9	3.0	72.4	2.7	75.5	3.6	5.53	<0.01	E > C & D; C = D
Estimated leg length, cm	70.8	4.0	71.3	4.2	75.3	5.1	5.03	<0.01	E > C & D; C = D
Sitting height ratio, %	50.7	1.2	50.4	1.3	50.1	1.0	1.02		
Sum of skinfolds, mm	35.9	21.0	31.2	10.7	31.3	15.8	0.82		
Fastest sprint, seconds	8.55	0.55	8.37	0.49	8.05	0.30	3.93	<0.05	E > D; E = C; C = D
Mean sprint, seconds	9.06	0.71	8.80	0.54	8.32	0.31	6.53	<0.01	E > D & C; C = D
Agility shuttle run, seconds	21.15	1.57	20.50	1.20	19.75	0.93	4.78	<0.05	E > D; E = C; C = D
Intermittent endurance run, m	1000	562	1376	697	1997	755	8.31	<0.01	E > D & C; C = D
Squat jump, cm	22.8	4.6	23.4	4.0	27.0	3.9	4.31	<0.05	E > D & C; C = D
Counter-movement jump, cm	25.5	5.3	25.8	4.1	29.0	4.4	2.84		
Ball control, # hits	15.8	9.2	25.4	26.2	31.1	12.5			
Ball control, log	2.55	0.72	2.73	1.02	3.35	0.46	3.16	<0.05	E > D; E = C; C = D
Dribbling speed, seconds	16.63	2.00	15.79	1.68	14.21	0.76	7.96	<0.01	E > D & C; C = D
Wall pass, points	17.0	3.4	18.0	3.1	19.7	2.2	2.83		
Shooting accuracy, points	6.7	2.7	6.3	2.5	7.3	2.3	0.84		
Task orientation	4.3	0.3	4.3	0.5	4.3	0.5	0.95		
Ego orientation	2.0	0.7	2.1	0.7	1.9	0.3	0.62		
	f		f		f				
Skeletal maturity status									
Late	7		8		2				
On time	7		33		5				
Early	7		13		5				
Stage of pubic hair (PH)									
PH 1	9		32		6				
PH 2	11		18		2				
PH 3	1		4		4				

*For timed events, lower scores indicate better performances.
[a]Information on years of training was not available for all players: drop-out, $n=11$; club level, $n=52$; elite, $n=12$. The *F*-ratio is based on a separate ANOVA.

between elite and club players, who did not differ in relative leg length or adiposity. Elite players performed significantly better in all functional capacities than the drop-outs except for countermovement jump, and significantly better than club players except for the agility run, squat jump, and Yo-Yo intermittent endurance run. Differences in functional capacities between club players and drop-outs were not significant. In contrast to size and functional capacities, the groups differed in only two of the four soccer skill tests. Task and ego orientation scores did not differ significantly among the three groups.

Among 13- to 14-year-old players, elite players were significantly older in chronological and skeletal age and had more years of training in soccer than club players and drop-outs at baseline; club players and drop-outs did not differ. Elite players were taller with longer segment lengths than club players and drop-outs, but relative leg length was not different. Club players and drop-outs did not differ in height and segment lengths. Body weight was significantly different only between elite players and drop-outs, while adiposity did not differ among the three groups. Elite players performed significantly better in all functional tests compared with drop-outs and better than club players in mean sprint, agility shuttle run, and Yo-Yo intermittent endurance run; club players and drop-outs did not differ in any of the functional tests. Elite players performed better than drop-outs in ball control, dribbling speed, and the wall pass, and better than club players only in the wall pass. Club players performed better than drop-outs in dribbling speed and the wall pass. Goal orientation was not significantly different among the three groups.

Late, on time, and early maturing boys were distributed equally among drop-outs, while late maturing boys were in the minority among club

Table II. Baseline chronological and skeletal ages, body size, functional capacities, sport-specific skills, and goal orientation of 13- to 14-year-old players classified as drop-outs, club level, and elite at follow-up and results of multivariate analyses of variance.

	Drop-out (D, $n=15$)		Club (C, $n=36$)		Elite (E, $n=21$)				
	Mean	*s*	Mean	*s*	Mean	*s*	*F*	*P*	*Post hoc* pairwise comparisons*
Training in soccer, years[a]	4.0	1.2	4.3	1.1	5.4	1.3	6.88	<0.01	E > C = D
Chronological age (CA), years	13.8	0.2	14.1	0.6	14.5	0.6	6.49	<0.01	E > D & C; C = D
Skeletal age (SA), years	14.0	0.9	14.5	1.2	15.3	0.9	7.17	<0.01	E > D & C; C = D
SA minus CA, years	0.2	0.9	0.4	1.1	0.8	1.1	2.11		
Weight, kg	49.4	8.4	53.0	10.8	59.2	7.7	5.08	<0.01	E > D; E = C; C = D
Height, cm	157.5	8.7	162.7	9.8	169.2	5.1	8.56	<0.01	E > D & C; C = D
Sitting height, cm	78.4	4.6	81.4	5.1	84.5	2.9	8.39	<0.01	E > D & C; C = D
Estimated leg length, cm	79.1	4.9	81.3	5.3	84.7	4.0	6.03	<0.01	E > D & C; C = D
Sitting height ratio, %	49.8	1.2	50.0	1.0	50.0	1.4	0.23		
Sum of skinfolds, mm	39.3	17.7	36.2	17.2	34.3	12.6	0.43		
Fastest sprint, seconds	7.99	0.41	7.83	0.35	7.60	0.35	5.48	<0.01	E > D; E = C; C = D
Mean sprint, seconds	8.29	0.45	8.11	0.39	7.80	0.37	7.10	<0.01	E > D & C; C = D
Agility shuttle run, seconds	19.15	0.53	18.89	0.93	18.01	0.75	10.90	<0.01	E > D & C; C = D
Intermittent endurance run, m	2344	939	2385	852	2998	878	3.78	<0.05	E > D & C; C = D
Squat jump, cm	27.4	3.4	28.3	4.1	30.7	3.8	3.86	<0.05	E > D; E = C; C = D
Counter-movement jump, cm	29.7	4.3	31.9	5.5	33.7	3.3	3.22	<0.05	E > D; E = C; C = D
Ball control, # hits	36.1	45.3	61.75	65.0	103.1	114.3			
Ball control, log	3.13	0.96	3.70	0.93	4.24	0.89	6.26	<0.01	E > D; E = C; C = D
Dribbling speed, seconds	14.02	1.18	13.31	0.74	12.97	0.57	7.40	<0.01	E > D; C < D; E = C
Wall pass, points	18.3	3.3	21.1	2.5	23.4	2.7	14.75	<0.01	E > C > D
Shooting accuracy, points	7.6	3.2	8.0	2.7	8.6	3.6	0.45		
Task orientation	4.1	0.7	4.2	0.5	4.2	0.5	0.33		
Ego orientation	1.8	0.5	1.8	0.7	1.8	0.5	0.05		
	f		f		f				
Skeletal maturity status									
Late	2		2		0				
On time	11		22		12				
Early	2		12		9				
Stage of pubic hair (PH)									
PH 2	7		6		0				
PH 3	3		15		7				
PH 4	5		15		14				

*For timed events, lower scores indicate better performances.
[a]Information on years of training was not available for all players: drop-out, $n=14$; club level, $n=35$; elite, $n=19$. The *F*-ratio is based on a separate ANOVA.

and elite players in the 11- to 12-year-olds at baseline (Table I). Among older players, only four boys were late maturing at baseline, with two drop-outs and two club players at follow-up, while 23 boys were early maturing at baseline, with 12 club and nine elite players at follow-up (Table II). Data for pubertal status were more variable. Most 11- to 12-year-old players at follow-up were either pre-pubertal (pubic hair stage 1) or early pubertal (pubic hair stage 2) at baseline, 20 drop-outs (95%) and 50 club players (93%) compared to eight elite players (67%) at baseline. Among older players, only eight drop-outs (53%) at follow-up were in mid- (pubic hair stage 3) and late- (pubic hair stage 4) puberty compared with 30 club (83%) and 21 elite (100%) players.

Cross-tabulation of players by skeletal maturity status and birth quarter at baseline within groups at follow-up is given in Table III. Among 11- to 12-year-olds, there was no association between maturity status at baseline and birth quarter among drop-outs and club players at follow-up. In the 12 elite players at follow-up, six were born in the first quarter of the year; four were classified on time in maturity status. Among four elite players born in the third quarter, 3 were early maturing.

Among 13- to 14-year-old players, 11 drop-outs (73%) were born in the second and third quarters, while 21 club players (58%) were born in the first half of the year. Among the latter, players born in the first quarter were on time in maturity status (7/10), and about a half of those born in the third and fourth quarters were early maturing (7/15). In contrast, 17 elite players (81%) were born in the first half of the year. Those born in the first quarter were largely on time in maturity status (7/9), while those born in the

Table III. Cross-tabulation of skeletal maturity status* by birth quarter in baseline age groups within status at follow-up 2 years later.

	Drop-outs				Club				Elite			
	L	OT	E	Total	L	OT	E	Total	L	OT	E	Total
11–12 years												
Birth quarter:												
1	0	0	2	2	1	9	5	15	1	4	1	6
2	5	3	1	9	4	7	3	14	0	1	1	2
3	0	3	1	4	3	10	1	14	1	0	3	4
4	2	1	3	7	0	7	4	11	0	0	0	0
13–14 years												
Birth quarter:												
1	0	2	0	2	2	7	1	10	0	7	2	9
2	1	4	1	6	0	7	4	11	0	3	5	8
3	1	3	1	5	0	3	3	6	0	2	1	3
4	0	2	0	2	0	5	4	9	0	0	1	1

*Late = L; on time = OT; early = E.

second quarter tended to be early maturing (5/8). The four elite players born in the third and fourth quarters were on time or early maturing.

Coach estimates of player potential for success at baseline are summarized by status at follow-up in Table IV. At 11–12 years, the potential of elite players at follow-up was rated as reasonable to very good at baseline and none was rated very weak or weak. In contrast, the potential of drop-outs at follow-up was rated primarily between reasonable and very weak at baseline; only four of 21 were rated as good or very good. Among club players at follow-up, most were rated from poor and good at baseline. At 13–14 years, the potential of all except one who moved to elite status at follow-up was rated as reasonable and higher at baseline, while the potential of drop-outs at follow-up was rated largely as weak and reasonable; ratings of club players at follow-up ranged from very weak to very good at baseline.

Table IV. Distributions of coaches' perceptions of potential for success in soccer at baseline among drop-outs, club players, and elite players at follow-up.

	Drop-out	Club	Elite
11–12 years			
Rating:			
very weak 1	7	3	–
weak 2	2	11	–
reasonable 3	8	19	5
good 4	3	16	2
very good 5	1	5	5
total	21	54	12
13–14 years			
Rating			
very weak 1	1	4	–
weak 2	5	6	1
reasonable 3	8	10	6
good 4	1	9	7
very good 5	–	7	7
Total	15	36	21

Discussion

In the present study, we compared baseline maturity status, body size and proportions, functional capacities, sport-specific skills, and goal orientation of youth soccer players aged 11–12 and 13–14 years classified as drop-outs and club or elite 2 years later. Elite players at follow-up were larger in body size and performed better in functional capacities at baseline in both age groups. Elite players also performed better in some, but not all, skill tests. At baseline, the three groups of players aged 11–12 years did not differ in chronological age or skeletal maturity status (Table I), but elite players aged 13–14 years were older chronologically and skeletally (Table II). The results are consistent with the notion that soccer systematically excludes later maturing boys and favours on time (average) and early maturing boys as age and sport-specific demands increase, especially during the interval that includes the adolescent growth spurt (Malina, 2003; Malina et al., 2000; Malina, Chamorro, Serratosa, & Morate, 2007a).

Our results are also consistent with comparisons of elite and non-elite youth players aged 10–14 years of age; elite players were taller, heavier, advanced in sexual maturation, and stronger (Hansen et al., 1999a, 1999b). Elite players aged 15–16 years were reported to be shorter and lighter and performed better in functional tests than sub-elite players (Reilly et al., 2000). The elite players performed better in dribbling but not shooting accuracy, which was in line with observations in both age groups in the present study. In a comparison of national team members and non-members aged 15–16 years, the former were taller and heavier but did not differ in skeletal maturity (Malina et al., 2000). Non-national team members included proportionally more early

maturing boys, which emphasizes the reduction in maturity-associated variation in body size as maturity is approached (Malina et al., 2004).

Observations based on player status 2 years after baseline differ somewhat from results of an earlier analysis that grouped players by maturity status (Figueiredo et al., 2009). In both age groups, boys advanced in skeletal maturity were taller and heavier than those on time and late in skeletal maturity; however, functional capacities and skills did not differ consistently by maturity groups. The former is consistent with maturity-associated variation in body size in the general population of boys (Malina et al., 2004), while the latter contrasts functional performances of adolescent males, which show a gradient of early > on time > late in strength, speed, power, and agility (Jones, 1949; Lefevre et al., 1988, Lefevre, Beunen, Steens, Claessens, & Renson, 1990). Differences among boys of contrasting maturity status persist when height and weight are statistically controlled (Beunen, Ostyn, Simons, Renson, & Van Gerven, 1981). Only the two vertical jumping tests showed a significant gradient of early > on time > late in 13- to 14-year-old but not 11- to 12-year-old players (Figueiredo et al., 2009).

The lack of functional and skill differences among adolescent soccer players of contrasting maturity status may reflect positive influences of regular fitness and skill training in the sport and/or selective practices. Boys lacking in soccer skills may not choose to play, may be encouraged to participate in another activity, and/or may not be selected by the club. Potential interactions among growth, maturation, functional capacities, and sport-specific skills of youth players in processes related to attrition, persistence or selection to a higher level need further study. A gradient of elite > club level > drop-outs in size, function, and skill was more clearly defined among the 13- to 14-year-olds than 11- to 12-year-olds at baseline.

Baseline task and ego orientation scores did not differ significantly among drop-outs and club and elite players (Tables I and II). In an independent sample of Portuguese youth soccer players aged 13–16 years, task orientation for school (4.3 ± 0.8) and club (4.2 ± 0.7) participants was similar to that for players in the present study, but ego orientation was slightly higher in school (2.1 ± 1.0) and considerably higher in club (2.8 ± 0.9) participants (Gonçalves et al., 2005). Among older adolescent players, results for goal orientation are variable. Elite Dutch players aged 16.4 ± 2.0 years scored, on average, slightly lower for task orientation (3.9 ± 0.6) but higher for ego orientation (3.6 ± 0.7) (Van-Yperen & Duda, 1999) than the 13- to 14-year-old elite players in the present study (4.2 ± 0.5 and 1.8 ± 0.5, respectively). Among English youth players aged 15–16 years, the elite players scored higher on task orientation than the sub-elite players but the groups did not differ in ego orientation (Reilly et al., 2000). Task and ego scores in the elite and sub-elite 15- to 16-year-old players were, on average, higher than those of 13- to 14-year-old elite and club level players in the present study. Using a different scale for goal orientation, an ego focus was associated with negative peer acceptance among Norwegian youth soccer players aged 12–19 years (Ommundsen, Roberts, Lemyre, & Miller, 2005) and with dropping out among elite Spanish track and field and tennis athletes aged 14–18 years (Cervelló, Escarti, & Guzmán, 2007). The results call for further exploration of potential associations among goal orientation, attrition, and persistence on the one hand, and growth, maturity, fitness, and skill characteristics of youth athletes on the other.

The differential success of players advanced in maturity status may reflect the interaction between maturity-related advantages in size and function and the immediate demands of the sport. Among 15- to 16-year-old players, those with more playing time during a 24-game season (median split) were, on average, significantly older, more fit (PACER, 12-min run), and more skilled in passing at the beginning of the season compared with those with less playing time, and proportionally more were sexually mature (pubic hair stage 5) compared with those with less playing time (Coelho e Silva, Figueiredo, Relvas, & Malina, 2005; Coelho e Silva, Figueiredo, Sobral, & Malina, 2004). Thus a combination of fitness, skill, and maturity status may influence playing time. Information on how player characteristics influence perceptions of coaches in determining playing time is not available. Nevertheless, subjective evaluations of player potential by coaches at baseline were reasonably consistent with player status at follow-up (Table IV). In both age groups, players classified as elite at follow-up were rated, on average, as having higher potential at baseline, while players classified as drop-outs at follow-up were rated at the weak end of the scale.

At follow-up, 22 drop-outs from both age groups completed a questionnaire based on a study of competitive youth swimmers (Gould, Feltz, Horn, & Weiss, 1981; Matos & Cruz, 1997). Information from this sub-sample suggested that conditions associated with daily routine and training were important in the decision to discontinue participation. Time was primary; specifically, a lack of time, need for more study time, and amount of time devoted to training. Aspects of the training environment included lack of opportunity to play in games, lack of enjoyment in training, and lack of recognition for effort. Another factor was changing interests, specifically interest in another sport. Although limited, the

results shed some light on the decision to cease participation in soccer. The observations are consistent with surveys of motives for sport discontinuation among American (Ewing & Seefeldt, 1988) and Mexican (Siegel, Peña Reyes, Cardenas Barahona, & Malina, 2004) youth. Potential interactions between training environment and individual differences in growth, maturation, function, and skill are unclear. Size, maturity, and function did not differ between drop-outs and club players in both age groups while several differences in skill were evident in older players. Variation in sport-specific skills *per se* and progress in skills during adolescence may be factors in the decision to discontinue participation.

The relative age effect in youth soccer is often attributed to a size advantage for players born early in the year (Helsen, Starkes, & van Winckel, 1998; Helsen, van Winckel, & Williams, 2005). Lack of information on variation in biological maturation, however, limits the size-based advantage. The distribution of drop-outs and club and elite players by birth quarter has potential relevance (Table III). Among 12 elite 11- to 12-year-old players at follow-up, four of six born in the first quarter were on time and three of four born in the third quarter were early maturing. Among the 13- to 14-year-old players, most drop-outs (73%) were born in the second and third quarters, while more than a half of club (58%) and most elite (81%) players were born in the first half of the year. Of note, proportionally more club and elite players born in the third and fourth quarters were on time and advanced in skeletal maturity. Variation in maturity status is a potential confounder in attributing the relative age effect to size and strength advantages of youth born early in the selection year (Malina et al., 2007b). Maturity status interacting with size and functional capacity is probably important.

The present study is limited by small numbers and to observations at baseline – before dropping out or moving to a more elite level and lack of information on the tempo of growth and maturation between baseline and follow-up. Information on growth and maturity status, performance capacity, and soccer skills of drop-outs and elite players at follow-up, and on rates of growth and maturation between baseline and follow-up, are also lacking. Nevertheless, the results provide insights into the selection process in youth soccer and highlight the interactions among physical growth and biological maturity status, functional capacity, sport-specific skills, and birth quarter, specifically among players moving to the elite levels as operationally defined. Task and ego orientation are apparently not related to the process of dropping out, persisting at the same competitive standard or moving up to a higher level in this sample of youth soccer players.

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