'The' pathway towards the elite level in Dutch basketball

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Chapter 2

Role of maturity timing in selection procedures and in the specialization of playing positions in youth basketball

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Abstract

This study investigated the role of maturity timing in selection procedures and in the specialization of playing positions in youth male basketball. Forty-three talented Dutch players (14.66 ± 1.09 years) participated in this study. Maturity timing (age at peak height velocity), anthropometrical, physiological, and technical characteristics were measured. Maturity timing and height of the basketball players were compared with a matched Dutch population. One-sample t-tests showed that basketball players were taller and experienced their peak height velocity at an earlier age compared to their peers, which indicates the relation between maturity timing and selection procedures. Multivariate analysis of variance (MANOVA) showed that guards experienced their peak height velocity at a later age compared to forwards and centers ($p < 0.01$). In addition, positional differences were found for height, sitting height, leg length, body mass, lean body mass, sprint, lower body explosive strength, and dribble ($p < 0.05$). Multivariate analysis of covariance (MANCOVA) (age and age at peak height velocity as covariate) showed only a significant difference regarding the technical characteristic dribbling ($p < 0.05$). Coaches and trainers should be aware of the interindividual differences between boys related to their maturity timing. Since technical characteristics appeared to be least influenced by maturity timing, it is recommended to focus more on technical characteristics rather than anthropometrical and physiological characteristics.

Keywords: talent identification, development, selection, position

Introduction

Basketball is a popular team sport worldwide among youth and adults. The national teams of the USA, Spain, and Argentina are the top three of the world ranking list of 2013[1]. The Dutch national team is at the bottom of this list, which means they are among the worst performing basketball teams in the world. This can partly be explained by the fact that only 2% of the children aged 10-14 in the Netherlands play basketball, indicating that the sport is fairly unpopular[2]. However, the poor performance of the Dutch national team is somewhat remarkable since height is one of the most important anthropometrical characteristics in basketball[3], and Dutch people are among the tallest people in the world[4]. With the basket located at 3.05 meter from the ground, being tall is an advantage to perform well. In youth basketball, the maturity timing of players influences their height. Maturation consists of structural and functional changes of the body during the development to maturity[5-7]. An often-used method to determine the maturity timing of players is estimating the age at which players show their peak height velocity. At this age, players experience their highest velocity of growth, and usually this occurs for boys at the age of 14[5,8]. However, the timing and tempo of maturity differ between individuals. In order to distinguish between players with respect to their maturation, they can be divided into early, average, or late mature groups. Earlier mature players experience their growth spurt and other body changes at a younger age compared to later mature players.

Research has shown that elite youth basketball players are significantly taller and experience their peak height velocity at an earlier age compared to sub-elite players[9,10]. In addition, anthropometrical differences have been found between the three different playing positions in youth basketball (guard, forward, and center). Guards are the smallest and experience their peak height velocity at a later age, whereas centers are the tallest and experience their peak height velocity at an earlier age[9,11,12]. These anthropometrical differences between level of performance (elite and sub-elite) and positions (guards, forwards, and centers) indicate the emphasis of maturity timing in youth basketball.

The aforementioned anthropometrical differences can also be found in adult basketball players[13-17]. However, in contrast to youth players, there is no longer an influence of maturity timing in adult basketball since these players are fully mature. In youth basketball, players in different phases of their maturity show large anthropometrical and physiological differences[18]. These differences can influence the interpretation of coaches and trainers regarding the performances of the basketball players. In order to improve the selection and specialization procedures of players, it is necessary to gain a better understanding of the role of maturity timing.

The aim of this study was to investigate the role of maturity timing in selection procedures and in the specialization of playing positions in youth basketball players. It was hypothesized that maturity timing has an influence on the anthropometrical characteristics of players and to a lesser extent to physiological and technical characteristics[9]. We further examined changes in playing position across several seasons.

Methods

Participants

Forty-three male basketball players (14.66 ± 1.09; age range 13-16) from a Dutch basketball academy participated in this study. This academy is a training center for talented youth basketball players in the northern part of the Netherlands. Players are selected or deselected by coaches and trainers each season, for one of the teams (U14, U16, or U18). The aim of the academy is to guide basketball players towards professionals in adulthood. The basketball players included in this study have playing experience of on average 5.33 ± 1.82 years. They train 14.82 ± 5.62 h per week and play on average 1.15 ± 0.92 matches per week. Players and parents/guardians gave written informed consent after being informed about the study procedure. The study was approved by the local research ethics committee and conformed to the recommendations of the Declaration of Helsinki.

Measurements

Anthropometrical characteristics. All anthropometrical measurements were performed by skilled testers. Height measurements for basketball players were done with a body length meter (Schinkel Medical, Nieuwegein, The Netherlands) on 0.01 centimeter accuracy, while players were standing against a wall. Sitting height was measured from the ground to the head, while players sat on the table with a straight back against the wall. By subtracting the height of this table from the measured height, sitting height was calculated. Leg length was calculated by subtracting the sitting height from the total height (i.e., height of players while they were standing against a wall). The plan of Frankfort was used to ensure all height measurements have been carried out the same way[19]. This means an upright posture of the head with the chin horizontally. In addition, body mass (kg) and fat percentage of players was measured with the Tanita Body Fat Monitor (TBF-300, Tokyo, Japan) while players were barefooted. The monitor controlled for other clothes (0.50 kg). Lean body mass (lbm) was calculated with the formula lbm = body mass – (body mass / 100) * fat percentage. The equation of Mirwald, Baxter-Jones, Bailey, and Beunen (2002) was used to determine the maturity offset of players (Maturity offset = −9.236 + 0.0002708 * leg length * sitting height) – (0.001663 * chronological age * leg length) + (0.007216 * chronological age * sitting height) + (0.02292 * body mass * height)[20]. Chronological age was determined by the formula: ((day of testing − day of birth) / 365) + ((month of testing − month of birth) / 12) + (year of testing − year of birth). Age at peak height velocity, which is the indicator of the maturity timing of players, was calculated by subtracting the maturity offset from the chronological age.

Basketball-specific characteristics. The Shuttle Sprint and Dribble Test is shown in figure 2.1 and contains three turns of 180°. Players had to perform three maximal

sprints of 30 meter with 20 s rest in between. The test was performed without ball (sprint) and with ball (dribble). Time was measured with photocell gates (Eraton BV, Weert, The Netherlands). Outcome measures were 'sprint' (the best of three sprints), 'repeated sprint' (the total time of the three sprints), 'dribble' (the best of three dribble attempts), and 'repeated dribble' (the total time of the three dribble sessions) (all in seconds). The Shuttle Sprint and Dribble Test is a reliable and valid test to measure physiological characteristics[21].

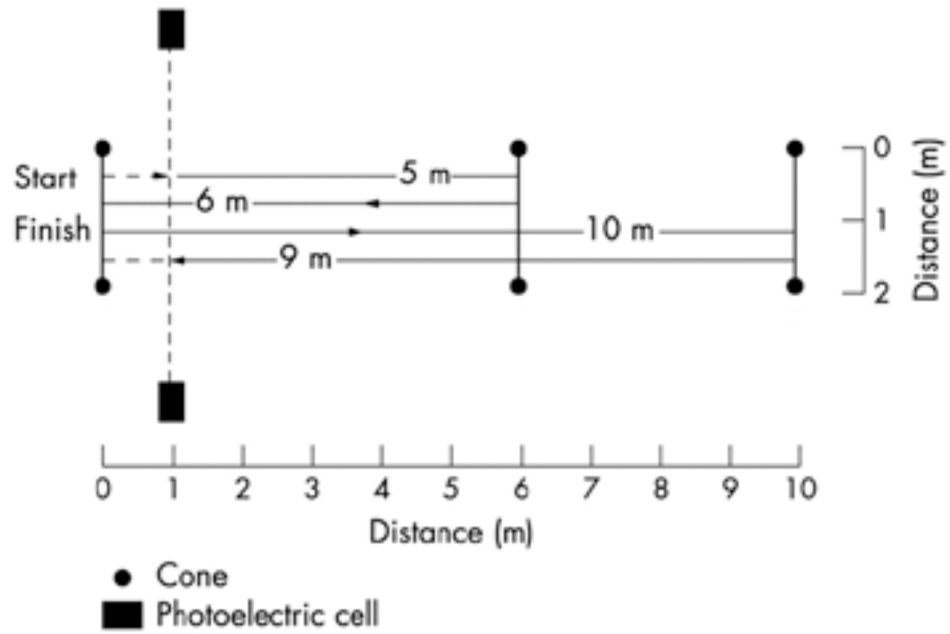

Figure 2.1: Course of the Shuttle Sprint and Dribble Test (adapted from Lemmink et al. 2004)[21].

The STARtest aims to measure change-of-direction speed (performing the test without ball) and ball control of players (performing the test with ball). The course of the STARtest is shown in figure 2.2. The test contains different forms of sprinting (forwards, backwards, and sideward slides) and changes of movements every 2 or 3 s, which makes this test a basketball-specific test. The test starts with a flying start between point AB after which players had to sprint forwards to point D, backwards to point E, side wards to point F, and forwards to points C and D. At this moment, players had to perform the same trajectory again on the other side of the field (G, H, C, D) and finally run forwards to point C and end between point AB. Time measurements started and stopped after passing line AB at the beginning and end of the test and were done by using a stopwatch. Outcome measures consisted of the time (s) when players perform the test without ball (change-of-direction speed) and with ball (ball control). Reproducibility (reliability and agreement) and validity of the STARtest was investigated in 52 basketball players performing a test-retest. The intraclass correlation coefficient (change-of-direction speed: 0.78; ball control: 0.80) and 95% confidence interval (change-of-direction speed: 0.64-0.87; ball control: 0.68-0.88) show good reliability. The agreement parameters standard error of measurement (change-of-direction speed: 0.33 s; ball control: 0.41 s), smallest detectable difference (change-of-direction speed: 0.92 s; ball control: 1.13 s), and coefficient of variation (change-of-direction speed: 1.77%; ball control: 2.03%) indicate good agreement between test and retest. In addition, it is shown that the STARtest is a valid test to measure performances of youth basketball players (discriminant validity was shown by significant differences in performances between age categories in the expected direction; construct validity was shown by sufficient correlations between Slalom Sprint and Dribble Test and the STARtest; sprint r = 0.74; dribble r = 0.60).

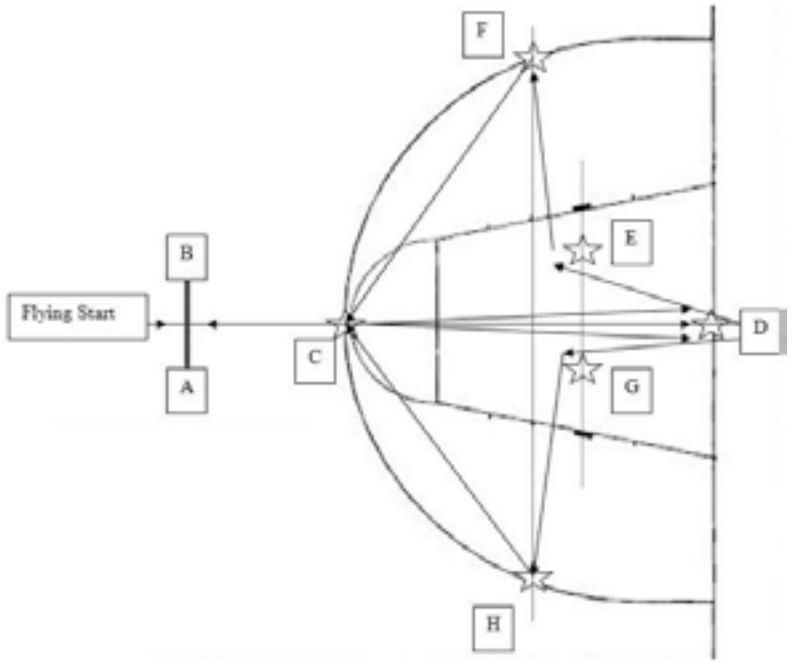

Figure 2.2: Course of the STARtest.

The vertical jump was measured using a yardstick device[22]. This device measures the maximal jump height to which players can push away sticks that are horizontally attached to a pole. Players were allowed to use a run-up and then jumped twice with their dominant leg, twice with their non-dominant leg, and twice with both legs. Sufficient rest between the jumps was ensured. Outcome measure is the lower body explosive strength of the dominant leg (m), since players mostly use this leg to jump during a game. Reliability of this test was determined by Gabbett et al. (2007)[22].

Players filled in a questionnaire about their playing position (guard, forward, or center). The playing position during the season before or after the season that is used for analysis in this study was used to investigate whether players changed position.

Procedures

All measurements have been carried in the afternoon at an indoor sports hall during the competitive season. Players were randomly divided into two groups; one group started with the anthropometrical measurements (height, sitting height, leg length, body mass, fat percentage, and lean body mass) and another group started with the physiological and technical field tests (Shuttle Sprint and Dribble Test, STARtest, and vertical jump test). During the physiological tests, sufficient rest in between was ensured. After about 1.5 h, the group of the physiological tests switched to the anthropometrical measurements and vice versa.

Statistical analysis

To investigate the role of maturity timing in selection procedures, anthropometrical data of the basketball players in this study were compared with a growth curve of a Dutch population, matched by age and gender[23]. One-sample t-tests were performed and effect sizes (Cohen's d) were calculated to investigate differences regarding the maturity timing and height for each age category. An effect size of 0.20 was considered small, around 0.50 moderate, and around or > 0.80 large[24]. To investigate the role of maturity timing in the specialization of playing positions, means and standard deviations for age (chronological age, age at peak height velocity), anthropometrical (height, sitting height, leg length, body mass, fat percentage, lean body mass), physiological (sprint, repeated sprint, change-of-direction speed, lower body explosive strength), and technical characteristics (dribble, repeated dribble, ball control) were calculated for guards, forwards, and centers. Multivariate analysis of variance (MANOVA) was performed to determine differences in age, age at peak height velocity, anthropometrical characteristics, physiological characteristics, and technical characteristics between playing positions. Effect sizes (Cohen's d) were calculated to interpret the differences in scores between the three playing positions. The aforementioned interpretations of effect sizes were used[24]. Furthermore, a multivariate analysis of covariance (MANCOVA) with chronological age and age at peak height velocity as covariate, and anthropometrical, physiological, and technical characteristics as dependent variables was performed. Bonferonni post hoc tests were used to specify the significant differences between positions. The level of significance for all statistical analyses was set at 0.05.

Results

Table 2.1 shows the height of basketball players in this study, the height of the average Dutch population matched by age and gender, the outcomes of the one-sample t-tests, and effect sizes. Although not significant, large effect sizes show that the 13- and 14-year-old players were taller compared to their Dutch peers ($d = 1.19$ and $d = 1.04$, respectively). For 15- and 16- year-old players, large effect sizes as well as significant differences in height were found between basketball players and their peers ($d = 2.05$; $p < 0.01$ and $d = 1.69$; $p = 0.02$, respectively). In addition, basketball players in this study experienced their peak height velocity at a significantly earlier age (13.06 ± 0.77) compared to boys aged 13-16 of the Dutch population (14 years) ($t(42) = -7.97$, $p < 0.01$).

Table 2.1: Height (m) of basketball players and the Dutch population[23], results of one-sample t-tests and effect sizes. Mean ± SD are shown.

Age (years)	Basketball players (m)	Dutch population (m)	t (df)	p	Effect size (Cohen's d)
13 (n = 10)	1.67 ± 0.08	1.62	1.73 (9)	0.11	1.19*
14 (n = 7)	1.77 ± 0.16	1.68	1.27 (6)	0.25	1.04*
15 (n = 14)	1.81 ± 0.06	1.75	3.69 (13)	< 0.01**	2.05*
16 (n = 12)	1.87 ± 0.10	1.79	2.81 (11)	0.02**	1.69*

Note: **significant difference at p < 0.05; *: large effect (d > 0.80).

Descriptive data of age, anthropometrical, physiological, and technical characteristics for the three different playing positions as well as effect sizes and results of the MANOVA are shown in table 2.2. MANOVA showed that chronological age was not significantly different between playing positions ($p > 0.05$). However, age at peak height velocity was significantly different between positions, with guards experiencing their peak height velocity at a later age compared to the other two positions ($p < 0.01$). Forwards ($p < 0.01$) and centers ($p = 0.02$) were significantly taller, had a higher sitting height ($p < 0.01$ and $p = 0.01$, respectively), were heavier ($p < 0.01$), and had a higher lean body mass ($p < 0.01$) compared to guards. In addition, forwards had a significant longer leg length compared to guards ($p = 0.01$). The physiological characteristics sprint (forwards faster than centers; $p = 0.04$) and lower body explosive strength (forwards higher than guards; $p = 0.02$) were significantly different between the three positions. Finally, guards had significantly better dribble performances (technical) compared to centers ($p < 0.01$).

Effect sizes indicated also the aforementioned differences between playing positions, but showed in addition a large effect size for the anthropometrical characteristics leg length and fat percentage (centers scored higher than guards), physiological characteristics sprint (guards faster than centers), repeated sprint (forwards faster than centers), and change-of-direction speed (guards and forwards faster than centers). In addition, a large effect size was shown for the technical characteristics dribble performances (forwards faster than centers), and repeated dribbling (guards faster than centers). Table 2.3 shows the results of the MANCOVA with chronological age and age at peak height velocity as covariate. It reveals that, after controlling for differences in age at peak height velocity between guards, forwards, and centers, there is only a significant main effect for the technical characteristic dribble ($p = 0.01$). Post hoc analysis showed that guards ($p = 0.02$) and forwards ($p = 0.049$) were faster than centers.

Information about position changes of players was available for 35 players. This data revealed that 11.4% (4 players) had a double position in the previous or next season (indicating that they were not specialized yet in one position). The majority of the players (77.1%; 27 players) did not change position, while 11.4% (4 players) did change position. Two players changed from forward to guard position (age 14 -> 15 and 15 -> 16), one player changed from center to forward (age 15 -> 16), and one player changed from forward to center position (age 16 -> 17).

Table 2.2: Age, anthropometrical, physiological, and technical characteristics of basketball players, according to their playing position as well as results of MANOVA and effect sizes. N=43.

	Mean ± SD			MANOVA		Effect sizes (Cohen's d)		
	Guards (n=14)	Forwards (n=19)	Centers (n=10)	F (df)	p	Guards vs. forwards	Guards vs. centers	Forwards vs. centers
Age								
Chronological age (years)	14.53 ± 1.25	14.81 ± 0.88	14.57 ± 1.29	0.30 (2,40)	0.74	0.26^{2}	0.03	0.22^{2}
Age at PHV (years)	13.73 ± 0.42	12.75 ± 0.66	12.47 ± 0.76	11.61 (2,40)	< 0.01	1.70^{1}	1.75^{1}	0.15
Anthropometrical characteristics								
Height (m)	1.70 ± 0.10	1.83 ± 0.08	1.83 ± 0.15	7.29 (2,40)	< 0.01	1.44^{1}	1.02^{1}	0.00
Sitting height (m)	0.86 ± 0.05	0.94 ± 0.05	0.94 ± 0.08	7.39 (2,40)	< 0.01	1.60^{1}	1.20^{1}	0.00
Leg length (m)	0.83 ± 0.05	0.89 ± 0.04	0.89 ± 0.08	5.18 (2,40)	0.01	1.33^{1}	0.90^{1}	0.00
Weight (kg)	54.39 ± 12.56	69.95 ± 13.09	71.78 ± 14.14	7.88 (2,40)	< 0.01	1.31^{1}	1.39^{1}	0.13
Fat percentage	8.75 ± 2.26	10.25 ± 4.42	11.78 ± 4.11	1.90 (2,40)	0.16	0.43^{2}	0.91^{1}	0.36^{2}
Lean body mass (kg)	49.43 ± 9.62	62.38 ± 9.14	63.18 ± 12.27	7.92 (2,40)	< 0.01	1.36^{1}	1.23^{1}	0.07
Physiological characteristics								
Sprint (s)	8.36 ± 0.45	8.36 ± 0.40	8.79 ± 0.42	3.94 (2,40)	0.03	0.00	0.99^{1}	1.05^{1}
Repeated sprint (s)	26.04 ± 1.53	25.95 ± 1.22	27.18 ± 1.36	2.97 (2,40)	0.06	0.07	0.79^{2}	0.95^{1}
Change of direction speed (s)	19.45 ± 1.15	19.38 ± 1.15	20.27 ± 0.75	2.52 (2,40)	0.09	0.06	0.84^{1}	0.92^{1}
Lower body explosive strength (m)	2.85 ± 0.23	3.06 ± 0.14	3.00 ± 0.25	4.55 (2,40)	0.02	1.10^{1}	0.62^{2}	0.30^{2}
Technical characteristics								
Dribble (s)	8.78 ± 0.51	8.97 ± 0.46	9.46 ± 0.60	5.38 (2,40)	< 0.01	0.39^{2}	1.22^{1}	0.92^{1}
Repeated dribble (s)	27.84 ± 1.38	28.15 ± 1.82	29.47 ± 2.15	2.95 (2,40)	0.06	0.29^{2}	0.94^{1}	0.66^{2}
Ball control (s)	21.26 ± 1.11	21.87 ± 1.45	22.21 ± 1.84	1.87 (2,40)	0.17	0.47^{2}	0.76^{2}	0.33^{2}

Note: (a,b): Within each row, means that do not share subscripts significantly differ from each other ($p < 0.05$); ^{1} small effect (d < 0.20), ^{2} moderate effect (d < 0.50), ^{3} large effect (d > 0.80).

Table 2.3: Results of MANCOVA with chronological age and age at PHV as covariate. Adjusted means (standard error) are shown. N=43.

	Guards	Forwards	Centers	MANCOVA	
	n = 14	n = 19	n = 10	F(df)	p
Anthropometrical characteristics					
Height (m)	[illegible]	[illegible]	[illegible]	[illegible] (2,40)	[illegible]
Sitting height (m)	0.91 ± 0.00	0.91 ± 0.00	0.92 ± 0.01	[illegible] (2,40)	0.92
Leg length (m)	0.86 ± 0.01	0.88 ± 0.01	0.88 ± 0.01	0.79 (2,40)	0.46
Weight (kg)	62.44 ± 1.9[illegible]	[illegible] ± 1.4[illegible]	68.34 ± 2.0[illegible]	1.56 (2,40)	[illegible]
Fat percentage	9.41 ± 1.1[illegible]	9.95 ± 0.91	11.56 ± 1.2[illegible]	0.86 (2,40)	0.43
Fat-free body mass (kg)	56.29 ± 1.4[illegible]	58.98 ± 1.0[illegible]	60.3[illegible] ± 1.4[illegible]	1.93 (2,40)	[illegible]
Physiological characteristics					
Sprint (s)	4.40 ± 0.12	4.45 ± 0.0[illegible]	4.71 ± 0.12	3.14 (2,40)	0.06
Vertical jump (cm)	26.34 ± [illegible]	[illegible] ± [illegible]	26.90 ± [illegible]	[illegible] (2,40)	0.05
Change-of-direction speed (s)	15.35 ± [illegible]	15.46 ± [illegible]	20.25 ± [illegible]	[illegible] (2,40)	0.05
[illegible]	2.58 ± 0.04	[illegible] ± 0.03	2.58 ± 0.04	1.41 (2,40)	0.26
Technical characteristics					
Dribble (s)	[illegible] ± 0.1[illegible]	[illegible] ± 0.10	9.41 ± 0.14	4.50 (2,40)	[illegible]
[illegible]	27.44 ± [illegible]	28.31 ± [illegible]	29.45 ± [illegible]	[illegible] (2,40)	[illegible]
[illegible]	21.16 ± [illegible]	21.67 ± [illegible]	22.08 ± [illegible]	0.88 (2,40)	0.42

Note: [illegible]

Discussion

The aim of this study was to investigate the role of maturity timing in selection procedures and in the specialization of playing positions in youth basketball. The results indicate that maturity timing has an influence on the selection procedure, since the basketball players that were selected for the basketball academy were taller and experienced their peak height velocity at an earlier age compared to their peers. These findings are in line with studies that showed a more advanced skeletal age in selected players compared to deselected players[25-27] and with a study of Santos Silva et al. (2013), which also demonstrated that basketball players were taller compared to their peers[3]. In addition, Hoare (2000) and Torres-Unda et al. (2013) showed that maturity parameters were positively related to the success of young basketball players[9,10]. All these results indicate that maturity timing is an important characteristic in youth basketball and that players who are more advanced in maturity are considered as better players than players who experience their maturity process at a later age. However, selecting players based on their maturity timing may be misleading and short-sighted for two reasons. First, the differences between players due to their maturity timing may disappear at the end of maturation[28-30]. For example, late mature players may be as tall as or even taller than early mature players at the end of their maturation[30]. It is therefore important for coaches and trainers to focus on the long-term development of players.

This was agreed upon by the trainers and the head of the Dutch basketball academy. In the future, they will more often use the players' predicted height (based on parents' height) instead of current height as a selection criteria (personal communication, 14 January 2014). Second, basketball is a multidimensional sport in which physiological, technical, tactical, and psychosocial characteristics also play an important role. Torres-Unda et al. (2013) showed for example that change-of-direction speed and ball handling are the most discriminating characteristics between elite and sub-elite basketball players, indicating other important characteristics basketball players should possess[10]. By selecting players mainly based on anthropometrical characteristics, coaches and trainers may overlook players that are talented, but experience their peak height velocity at a later age (i.e., false negatives) since the performances of these later maturing players are overwhelmed by the performances of earlier mature players. To avoid this problem, it is suggested to coaches and trainers to focus more on technical characteristics as selection criteria instead of anthropometrical characteristics.

The differences in age at peak height velocity between players of different positions found in this study suggest that maturity timing also influenced the specialization of playing positions. Coaches and trainers appear to be influenced by the maturity timing of players when choosing their playing position. The tallest players, who also experience their peak height velocity at an earlier age, are preferably placed on the center position, while the guard position is commonly played by players who experience their peak height velocity at a later age. These results are in line with other studies who showed that maturity timing and anthropometrical characteristics determine a player's position in basketball and other team sports[15,31,32]. However, specialization of playing positions based mainly on anthropometrical characteristics may lead to a non-optimal development of talented basketball players because, as mentioned earlier, later mature players may catch up with the earlier mature players[28,30].

After statistically controlling for differences in maturity timing between players, our results showed only a significant difference between positions for the dribble performances. This result suggests that technical characteristics seem to be less influenced by the maturity timing of players compared to anthropometrical and physiological characteristics, which supports our hypothesis and other research regarding basketball players and soccer players[33,34]. Although research has shown that technical characteristics can discriminate between elite and sub-elite athletes[35,36], the present study is unique since it also investigated technical differences between players of different positions. These technical characteristics seem to be very important in choosing the most appropriate position for players. When coaches ignore the influence of maturity timing in selecting players for a certain position, players may not get the opportunity to develop themselves at the position that best fits them. Therefore, when choosing the most appropriate position, coaches and trainers should consider the technical characteristics of players, rather than their anthropometrical or physiological characteristics. However, results of this study regarding maturity timing have to be interpreted cautiously due to the measurement method. The formula of Mirwald et al. (2002) was used to estimate the maturity offset of players[20]. Although this method is often used to estimate the maturity timing of athletes[8,37,38], recent research has shown that this method has some limitations[39]. This ensures that the results of this study regarding the maturity timing have to be interpreted cautiously.

To focus more closely on the specialization of playing positions, we investigated whether players changed position during two consecutive seasons. The results suggest that most players are specialized in one position at an early age and stay at this position during their development. According to Dezman et al. (2001), this early specialization is disadvantageous for the development of players since players should preferably start to specialize in one position from the age of 16[40]. Players younger than 16 years should train in a more versatile manner and practice at different positions. The results of several other studies also encourage players to participate in more sports at a younger age to develop fundamental motor skills, and to specialize from an age of 13-15 in one main sport[41-43]. Furthermore, one of the factors to success at senior level may be participating in multiple sports at a younger age and specializing in one main sport at a later age [6,41,44-46]. It is likely to assume that this principle can also be applied to the specialization for a certain position in basketball. Although players in this study did not often change position at a young age, it is recommended to train at various positions at early ages, and specialize in one position at a later age. In this way, players increase their chances of becoming an elite basketball player in adulthood since they are developed all-round and thus can eventually play at more than one position. Further research with more participants is recommended to clarify the (direction of) changes found in this study.

Conclusion

It is important for coaches and trainers to be aware of the differences in maturity timing between youth boys, since this can lead to large anthropometrical and physiological differences between them. Based on the results of this study, we recommend that coaches and trainers focus on technical instead of anthropometrical characteristics of players when selecting them for a selection team as well as for the specialization of a player's position. Rather than aiming at only short-term success, the long-term development of basketball players should be a priority. Furthermore, to increase a player's opportunity to eventually become a professional basketball player, it is suggested to train at different positions at a young age and specialize in one position at a later age (>16 years).

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