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'The' pathway towards the elite level in Dutch basketball

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Chapter 8

General discussion

The studies in this thesis investigated the performance development of talented youth male basketball players (aged 13-19) aiming to achieve the elite level in adulthood. The data provide unique information about the performance development of players of different positions in different age categories. The results of the studies indicate the value of monitoring the development of basketball players in a multidimensional and longitudinal way, with an individual focus. The main results of the studies are discussed below.

The importance of maturity timing and height

Results of this thesis revealed that Dutch basketball players who were selected for the talent development program matured earlier and were taller compared to their peers (chapter 2). The players in this study grew on average from 1.70 ± 0.12 m at age 13, to 1.87 ± 0.07 m at age 16, up to 1.90 ± 0.09 m at age 19, which is similar to the height of basketball players in other studies¹⁻³. Players of this thesis reached their peak height velocity at a mean age of 13.06 ± 0.77 years, which is earlier than typically developing boys who, according to reference values of the population, experience their highest velocity of growth at the average age of 14 years^{2,4}. In chapter 2 and 6 findings on maturity and height differences based on player's position were reported, with centers maturing earliest and being the tallest players followed by forwards and guards. These differences are in accordance with literature⁵⁻⁷. More interesting, results of chapter 6 indicated the overall importance of height in basketball by showing that within each position players who achieved the elite level of performance were taller compared to their colleague basketball players who did not achieve the elite level.

Considering the explicit and implicit game components of basketball, i.e., the basket located at 3.05 m, and the positional roles within a team, it is plausible that being tall is an advantage to perform well, especially for center position players. However, coaches, trainers, and scouts should be careful not to emphasize height of youth players too much, since there are considerable interindividual differences and players are not fully matured until they reach the age of approximately 16 years^{4,8}. Recent research of Torres-Unda et al. (2015) also confirmed that maturity status may be a very important factor in the performance of elite adolescent basketball players¹⁰. Players who mature late (and who are thus temporarily smaller than their colleague basketball players) may be overlooked due to their temporary smaller stature. As a consequence, these players may not be provided with the same opportunities (i.e., RTC selection team environment) to optimize their performance, despite that differences in capability attributable to differing timing and tempo of maturity may disappear once players have fully matured^{4,9,10}.

Another consequence of the strong emphasis on height is that it might discourage smaller children to choose basketball as their sport. This is indicated by the relatively low participation rate of youngsters in competitive basketball¹¹. A study with French youth basketball players showed an overrepresentation of dropouts among players aged 9-15 years born in the third and fourth quarter of the year. Due to the birth date of these children relative to the timing of the

basketball season (i.e., cut-off date for youth competitions being 1st of January), these children are likely to be (temporarily) smaller and less physical developed compared to their colleague basketball players born in the first and second quarter of the year¹². Smaller players are likely to have compromised ability perceptions and to lose fun and motivation as they have to compete against taller and stronger players, which can ultimately result in dropout¹²⁻¹⁵.

In order to prevent talented players from being overlooked, and to increase the participation rate and decrease the dropouts, it might be useful to reduce the emphasis on players' height in youth basketball. One strategy to achieve this is to use body-scaled equipment, for example by different heights of the basket for youth players aged 12-16 years. Affordances, i.e., opportunities for actions, that are body-scaled enhance technical and tactical skill acquisition and are likely to increase fun and motivation¹⁶⁻²¹. There are already some adjustments in the basketball game for younger players in the Dutch basketball competition (< 12 years), for example the basket located at 2.60 m²². However, most youth's bodies are not fully matured until the age of 16^{4,8}. Children between the age of 12 and 16 are therefore highly vulnerable to the effects of maturation⁴. It is, as a consequence, suggested to adjust the height of the basket to players' height till the age of 16 (i.e., adjusting the explicit game component). Anthropometrical differences between children and adults can be used as a rationale to scale the height of the basket. The average height of a Dutch adult man is 1.85 m and the basket in the Dutch competition is located at 3.05 m²³. This means a ratio of approximately 1 to 1.65 for adult players. Dutch males aged 12-13 (U14) and 14-15 (U16) are on average 1.59 m and 1.72 m, which indicates the basket at a height of 2.62 m and 2.84 m, respectively²⁴. According to this ratio, the basket for U12 should be located at 2.43 m (i.e., the average height of Dutch males aged 10-11 is 1.47 m). It is suggested to play with the basket located at 3.05 m from 16 years onwards, to deal with the explicit game components as played in adult basketball.

In conclusion, height plays a major role in youth basketball. Differences in maturation and height have been identified between players participating in this thesis and their peers, and between players of this thesis of different playing positions. It is suggested to reduce this emphasis on height in youth by using different heights of the basket for players of the U12 (2.43 m), U14 (2.62 m) and U16 (2.84 m) team. This adjustment aims to counteract the benefits from being (very) tall, and as such to prevent talented players who mature later from being overlooked. Players will also be stimulated and challenged to practice other, more trainable basketball-related performance skills (e.g., technical skills). In addition, the decreased emphasis on height might encourage more children to play basketball. All these possible positive effects might in turn increase the level of basketball performance in the Netherlands in the long-term by creating a larger pool of basketball players to choose from when identifying talented players.

Development of physiological and technical skills and the role of reflection

In order to achieve the elite level of performance, players should be aware of the requirements of the basketball game which are necessary to achieve this ultimate goal²⁵. These requirements differ slightly between players of the guard, forward, and center position since these positions all have different tasks within a team²⁶. For example, guards need to start the offence during a game and need to get past their opponents. Repeated sprint, change-of-direction speed and ball control can therefore, among others, be considered as position-related characteristics for guards (chapter 6). Results of chapters 3 and 4 revealed a performance improvement of these skills over time. The increase in repeated sprint ability was most evident from the age of 14 (26.09 ± 0.94 s) through 17 (25.18 ± 0.97 s; improvement of 3.49%), with a slowing rate of increase until age 19 (24.82 ± 1.04 s; another 1.43 % improvement) (chapter 3). For change-of-direction speed, it was found that players aged 18-19 (18.00 ± 0.78 s) were significantly better (i.e., faster on the STARtest without ball) compared to 14-15 year old players (19.06 ± 1.05 s) (chapter 4). Results of this chapter also showed an improvement in ball control over time, with players aged 16-17 (19.45 ± 1.06 s) and 18-19 (19.03 ± 0.94 s) being significantly faster on the STARtest with ball compared to 14-15 year old players (20.48 ± 1.25 s). Moreover, the largest improvement in ball control was found for guard position players, suggesting the importance of ball control especially for these players (chapter 5).

The performance development is caused by, among others, the effects of maturation and the number of training hours. However, the efficiency of training hours, and therewith reflective skills of players, may be even more important in order to improve basketball-related skills²⁷⁻³⁰. To derive most from training hours reflective skills, i.e., the capability to appraise previous performance to improve future performance, are of utmost importance²⁷⁻³⁰. In chapter 5 it was revealed that reflective skills of talented youth basketball players, as measured with the self-regulation of learning self-report scale (SRL-SRS), do not develop over time but are highly important in achieving the elite level of performance. Results of this chapter showed a high score on reflection (4.03 ± 0.54) for the total group, and an even higher score (4.29 ± 0.29) for players who attained the elite level of performance in adulthood (range 1-5). These scores were similar to the results of other research in a variety of sports³⁰⁻³², and strengthen the idea that reflection is important in order to achieve the elite level of performance.

As suggested in chapter 5, reflective skills are thought to be most useful when players apply these skills in order to achieve a specific goal (i.e., improve their basketball-related skills). For example, a player predefines a goal related to the improvement of his repeated sprint ability. This player consequently needs to make a plan on how to reach this goal, and needs to reflect continuously on his repeated sprint ability in order to improve this skill. Previous research has demonstrated that coaches and trainers are in a position to increase the use of reflection among talented athletes. For example by helping athletes to make effective judgments about their performance, compare performance to the predefined goals, and helping athletes to identify points for improvement^{33,34}.

Both the study by Collins et al. (2014) and Faull et al. (2009) showed that talented athletes who are aiming to achieve the elite level of performance can increase their use of reflective skills, which may ultimately result in increased performance^{33,34}.

It can be concluded that each playing position has slightly different requirements in order to perform well during a basketball game. However, reflection can be considered as an important skill for talented youth basketball players of all playing positions, aiming to attain the elite level of performance in adulthood. Using these reflective skills in order to improve other basketball-related skills is thought to be helpful in achieving the elite level.

Towards individual profiles

For basketball players who spend many hours in training to improve their skills, it is important to measure and monitor their performance to gain insight into their development. As suggested by literature and the research presented in this thesis, players should be monitored structurally in order to measure progression rather than assessing performance at a single occasion³⁵. The studies presented in this thesis showed outcomes applicable for the total group of players (e.g., chapter 5), as well as outcomes distinguished by age categories (e.g., chapter 3), positions (e.g., chapter 2), and individual differences (chapter 6). Players might show weaknesses in one skill, but may excel in others, which is known as the compensation effect³⁵. Chapter 6 has shown that players who achieved the elite level differ during their development in their anthropometrical, physiological, technical, and psychosocial characteristics. This indicates that the combination of characteristics necessary for achieving the elite level might be different for individual players. Therefore, individual profiling in a multidimensional and longitudinal approach seems valuable³⁶⁻³⁹.

However, applying this individual focus in science is a considerable challenge. Science is characterized by universal laws in which researchers strive to find regularities or patterns that can be applied to a whole population⁴⁰. Nevertheless, experts in sports (or other domains like music and education) are individuals who do not comply with regularities. Rather, their performance can be considered as outliers which might suggest a need for other methodological approaches to study expertise, such as applied in chapter 6.

In conclusion, performance-related differences between age categories, positions, and individual players were identified in the studies of this thesis. These individual differences were also evident in the development towards the elite level of performance in adulthood. Therefore, a focus on individual profiling is recommended within the multidimensional and longitudinal research on talent development.

Limitations and recommendations for future research

The conclusions in this thesis are based on data obtained with frequently used and feasible methods of which reliability and/or validity has been confirmed.

However, caution is required when interpreting the results since there are some limitations associated with these methods. The formula of Mirwald et al. (2002)⁴¹ to estimate players' age at peak height velocity, for example, is less applicable to early maturing players compared to average maturing boys, and is still being discussed in literature^{8,42}. Nevertheless, due to its practical feasibility and the lack of other suitable non-invasive methods, this formula is still used in research related to young athletes⁴³.

This thesis applied a multidimensional and longitudinal approach in which different characteristics were investigated to obtain a holistic overview of the performance development of players. However, one should be aware of other characteristics that also might have an effect on the performance development of talented basketball players. Tactical characteristics, for example, belong as well to the multidimensional performance characteristics related to basketball, and have been proven to play an important role within team sports performances^{44,45}. Due to practical reasons, tactical characteristics were not included in this thesis. Another important aspect to take into account when considering the development of talented youth players are injuries. As shown in our review (chapter 7), injuries hinder the development of basketball players. Despite that we provided an overview of the literature related to the recovery process of injuries, we were unable to monitor the frequency and duration of the injuries sustained by players investigated in this thesis. Especially in view of the age range of our target group, it is recommended to take into account the effects of injuries on the development of players in future research. Considering the vast number of factors influencing talent development, the challenge is to approach the development of talented basketball players in a manner that is as inclusive as possible⁴⁶.

A last remark that should be made refers to the elite level of performance as specified in the studies of this thesis. The elite level of performance was defined as playing at the highest competition level in the Netherlands (Eredivisie). Despite that it is an excellent achievement when players attain this level, it should be noted that the elite level in the Netherlands is relatively low compared to the elite level of basketball in other countries, such as in the USA⁴⁷. Reference values as shown in this thesis may as a consequence be representative for Dutch basketball players. It is, therefore, suggested that coaches and trainers develop reference curves for the performance of their own players.

Recommendations for basketball practice

The results of this thesis indicate the value of monitoring the performance development of talented youth basketball players in a multidimensional and longitudinal manner, with an individual focus. Although further research is needed to unravel the development of talented youth players towards the elite level even more, this thesis has revealed a number of recommendations for coaches, trainers, scouts, and policy makers involved in youth basketball:

- *Adjust the height of the basket according to the height of players (body-scaled) in the U12 (2.43 m), U14 (2.62 m), and U16 (2.84 m) teams.* This might reduce the emphasis on height in youth basketball. It might prevent late maturing players from being overlooked, challenge early maturing players more, and it will encourage players to practice basketball-related skills that are trainable (e.g., physiological and technical skills). Furthermore, the decreased emphasis on height is likely to increase the fun and motivation of young players, and as a consequence improve the participation rate and reduce the number of dropouts. Ultimately, this may increase the level of basketball performance in the Netherlands.
- *Stimulate the use of reflective skills of basketball players.* Reflective skills are important for players of all playing positions in order to attain the elite level of performance. Talented youth basketball players are advised to use their reflective skills in order to reach a predefined goal (e.g., improving a basketball-related skill). Coaches and trainers can help players by challenging them to think about their own development. Making the player aware of the requirements that are necessary to reach their goal, and to make an efficient plan to meet this goal may promote players' development of basketball related skills.
- *Monitor multidimensional performance characteristics in a longitudinal manner with an individual focus.* This will provide insight into the individual performance development of talented youth basketball players, to help players in reflecting upon them when working towards their goals. The performance characteristics can be measured at the beginning and end of each season, as demonstrated in the 'Groningen Basketball Test Battery'. Data regarding anthropometrical, physiological, technical, and psychosocial performance characteristics could be recorded to create individual performance profiles of players. Scores within and between seasons could be compared in order to gain insight into the players' development. The individual focus can be applied by using Z-scores and radar graphs when analyzing the data related to the development of players. Coaches and trainers can use the players' performance profile to discuss their development, in order to set short- as well as long-term goals for training and competitions. In addition, the performance profile can be used for players who sustain an injury. After the recovery period, the player can be tested, and results can be compared to scores before the injury in order to determine whether pre-injury levels of performance are reached. More information about the performance characteristics, protocols of the tests, data analysis, interpretation, and reference values can be found in the 'Groningen Basketball Test Battery'.

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