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'The' pathway towards the elite level in Dutch basketball

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Summary

Earlier investigations emphasized the importance of multidimensional and longitudinal research regarding talent development in sports. However, to our knowledge, studies related to the development of talented youth basketball players over the years are scarce. Therefore, the overall aim of this thesis was to gain insight into the performance development of talented youth male basketball players (aged 13 - 19) by adopting a multidimensional and longitudinal approach. Multidimensional performance characteristics (anthropometrical, physiological, technical, psychosocial characteristics) were monitored for five seasons in youth basketball players selected for a talent development program. The total sample included 6448 data points from 99 individual players. These data provided unique information about the performance development of talented basketball players in different age categories who eventually achieved the elite or non-elite level of performance in adulthood.

Chapter 1 described the theoretical background of the studies in this thesis. It stated that the performance development of players is the result of their personal performance characteristics, which are related to the characteristics of the game and influenced by the environment.

The **2nd chapter** investigated the role of maturity timing in selection procedures and in the specialization of playing positions in youth basketball (guard, forward, center). It revealed that basketball players selected for the talent development program were taller and experienced their peak height velocity (PHV) at an earlier age compared to their peers. These results suggest a relation between maturity timing and selection procedures. Furthermore, it has been shown that most players were specialized in one position at an early age and stay at this position during their development. The result of the second part of the study indicated positional differences between guards, forwards, and centers for maturation timing (age at PHV), anthropometrical, physiological and technical performance characteristics. In addition, when statistically controlling for chronological age and age at PHV, it was shown that technical characteristics were least influenced by maturity timing. It was therefore recommended to coaches and trainers of talented youth basketball players to focus more on technical rather than anthropometrical and physiological performance characteristics with regard to selection procedures and the specialization of playing positions.

Given the intermittent character of a basketball game, repeated sprint ability is an important physiological skill for youth basketball players. **Chapter 3** investigated the development of repeated sprint ability in players between 14 and 19 years by using multilevel modeling. Repeated sprint ability improved mostly between 14 and 17 years of age, and reached a plateau at age 17 to 19. Lower body explosive strength and interval endurance capacity appeared to play an important role in order to develop repeated sprint ability. Furthermore, results of this chapter provided age-specific reference values for repeated sprint ability, which may assist coaches and trainers in setting appropriate goals for individual players.

The thesis continued with the investigation of a new basketball-specific test, the STARtest (**chapter 4**). The test was developed to measure change-of-direction speed (performing the test without ball) and ball control (performing the test with ball) of talented youth basketball players. The test consists of basketball-specific movements, i.e., sprinting or dribbling in a forward, backward, and sideward direction. Reproducibility (reliability and agreement) and validity parameters were calculated and showed that the STARtest is a reproducible and valid test. Furthermore, it appeared to be a feasible test which easily can be used by coaches and trainers to monitor change-of-direction speed and ball control of basketball players.

Chapter 5 continued research regarding the STARtest by investigating the importance of ball control and self-regulatory skills (e.g., setting goals, reflecting on one's strengths and weaknesses) in achieving the elite level of performance in basketball. It was shown that reflective skills were most important in order to achieve the elite level of performance. This chapter further aimed to gain insight into the development of, and association between ball control and reflection. The results of multilevel modelling showed no significant improvement in reflection over time for players of guards, forwards, and centers. For ball control, an improvement was evident for guards. Moreover, guards and forwards had better ball control compared to centers. For those two positions, a higher reflection was related to better ball control. This chapter concluded that reflective skills are important for players of all positions to achieve the elite level of performance in adulthood, while ball control is especially important for the guard position players.

The abovementioned multidimensional performance characteristics were all combined in **chapter 6**. The first aim of this study investigated whether it was possible to identify position-related characteristics for players of the guard, forward, and center positions. Results revealed that repeated sprint (best of three), change-of-direction speed, repeated dribble (best of three and total), and ball control were position-related characteristics for guards, while height, wingspan, and effort were position-related characteristics for centers. For forwards, no position-related characteristics could be determined. The second aim was to investigate whether players who attained the elite level performed better during their youth on general basketball-related performance characteristics (i.e., all performance characteristics together) than their peers who did not achieve the elite level. Results confirmed that the elite players had higher levels of performance characteristics during youth compared to their non-elite peers of the same position. In addition, within the second aim it was also investigated whether elite players performed better on position-related skills compared to non-position-related skills. The centers who reached the elite level in adulthood performed better on their position-related skills compared to their non-position-related skills. Finally, the third aim of this study was to investigate possible differences in the development between players who achieved the elite level of performance. Radar graphs of individual players showed individual variations in the development of talented youth players towards elite levels in adulthood, even between players of the same position.

Considering the development of basketball players in a more comprehensive view, the rehabilitation process of injuries was reviewed in **chapter 7**. To minimize the negative influences of injuries on the personal development of players, a successful outcome of the rehabilitation process is important. The chapter aimed to review psychosocial factors that affect the rehabilitation process following anterior cruciate ligament injuries (ACL), which is a common injury in basketball. The systematic search resulted in an overview of psychosocial factors (e.g., goal setting) and interventions (e.g., relaxation and imagery sessions) which could be beneficial for the rehabilitation process, and therefore minimize the negative effects on the performance development of players.

Finally, **chapter 8** provided the general discussion, conclusions, and practical implications for coaches and trainers working with talented youth basketball players. It can be concluded that anthropometrical characteristics develop, and physiological and technical performance characteristics improve over time, while the psychosocial skill reflection stays relatively stable throughout adolescence. The general discussion ended with three recommendations for basketball practice:

- 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.
- Stimulate the reflective skills of basketball players, since results of this thesis showed the importance of reflection in achieving the elite level for players of all playing positions.
- Monitor multidimensional performance characteristics in a longitudinal manner with an individual focus in order to take the individual differences between players into account.