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'The' pathway towards the elite level in Dutch basketball

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Document Version

Publisher's PDF, also known as Version of record

Publication date:

2016

[Link to publication in University of Groningen/UMCG research database](#)

Citation for published version (APA):

te Wierike, S. C. M. (2016). 'The' pathway towards the elite level in Dutch basketball: A multidimensional and longitudinal study on the development of talented youth basketball players. Rijksuniversiteit Groningen.

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Chapter 1

General introduction

Background

Rik Smits, the Dunkin' Dutchman, is a great example of a Dutch basketball player who has achieved the international elite level of performance in adulthood. The 2.24 m tall center played twelve years for the Indiana Pacers in the National Basketball Association (NBA) of the United States of America. He started his career in the Netherlands at PSV/Almonte Eindhoven and then moved to the United States of America to play for Marist College. After only a few years he was scouted by the NBA. Due to a combination of his height and the great effort he put in, for example by spending extra training hours before and after the regular training sessions with his team, he became the most successful Dutch basketball player up to today and is an example for many youth players¹.

In the Netherlands, sport has a high priority as illustrated by the ambition of the NOC*NSF (Dutch Olympic Committee*Dutch Sports Federation) to rank among the top-ten sports countries in the world. Scientific research related to the development of talented youth athletes towards the elite level in adulthood can be helpful to reach this goal. As acquiring expertise is a long-term process influenced by various factors, a multidimensional approach is recommended in research related to talent development^{2,4}. The research described in this thesis focuses on the performance development of talented youth male basketball players aged 13-19 years. Multidimensional performance characteristics of basketball players are measured with the 'Groningen Basketball Test Battery'. The tests are related to biological maturation (sitting height, leg length, and body mass for calculating age at peak height velocity (PHV)), anthropometrical (height, wingspan, fat percentage, lean body mass), physiological (sprint, repeated sprint, change-of-direction speed, lower body explosive strength, interval endurance capacity), technical (dribble, repeated dribble, ball control), and psychosocial characteristics (reflection, planning, evaluation, self-monitoring, effort, and self-efficacy (aspects of self-regulation)). The basketball players participating in this thesis were selected by coaches and trainers for a talent development program. In literature, a talented athlete is considered as a player who performs better than his peers, and has the potential to achieve the elite level in adulthood^{2,5,6}. In order to consider the potential of basketball players, and to take into account the unstable, non-linear development of performance characteristics, this thesis seeks for appropriate statistical and methodological analyzes^{2,4,7,8}. A total of 99 talented youth basketball players (aged 13-19) are monitored during five consecutive seasons (2008-2009 to 2012-2013). Sixteen characteristics were measured two or three times each season, resulting in 6448 data points. So, a multidimensional and longitudinal approach was used, which is more and more common in research related to talent development⁹. The results of this thesis give insight into the performance development of talented basketball players, and will provide recommendations for basketball coaches, trainers, scouts, and policy makers to guide talented youth basketball players towards the elite level of performance in adulthood.

Theoretical framework

The performance development (i.e., accumulation of performance until a certain moment) of talented youth basketball players is the result of their personal characteristics, which are influenced by characteristics of the basketball game and the environment (figure 1.1). The interaction between these components, i.e., the basketball game, the environment, and the basketball player himself, related to the effects of maturation, self-regulation of learning and training, together with a component of chance, determines the performance development of each individual basketball player over time².

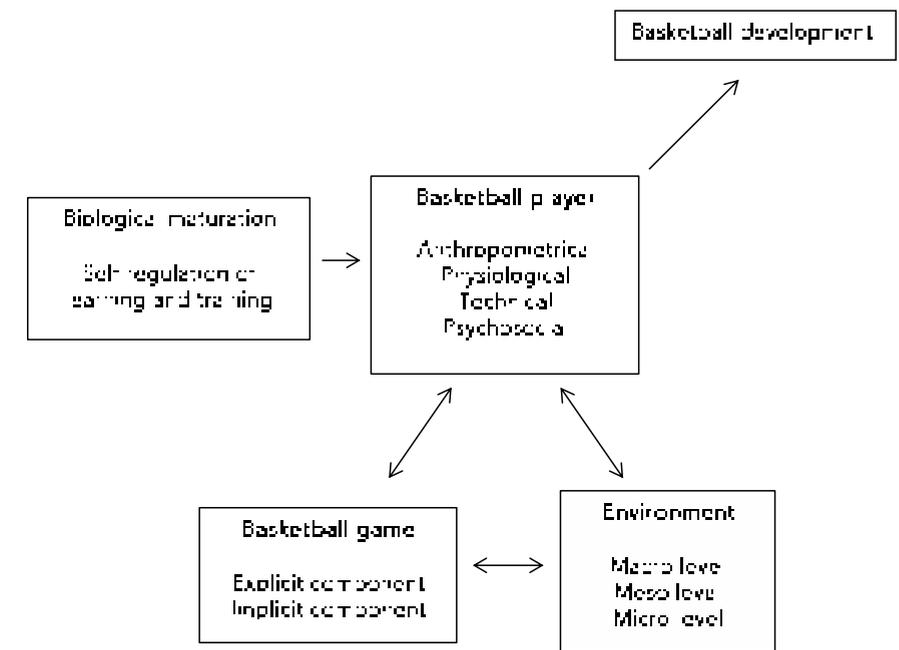


Figure 1.1: Theoretical framework to illustrate the performance development of talented youth basketball players^{2,10}.

Basketball game

The requirements of the game, in which players need to optimize their performance, are considered across two levels. First, the explicit game components refer to the rules imposed by the Dutch Basketball Federation that specify the basketball game¹¹. Basketball is an intermittent team sport in which two teams of five players on the court try to score points by shooting the ball in the basket of the other team. The aim is to score more points than the opposing team at the end of the four ten minute quarters play time (as played in the Dutch

basketball league).

Second, the different positional tasks within a team can be considered as the implicit game components. The five players within a team have different roles during the game in order to achieve their common goal, i.e., winning the game. The guards are responsible for the start of the offence for their team (i.e., the playmakers) and try to disrupt the offence of the other team. The forwards fulfill a more versatile playing position. Their task is, for example, to score either from close to the basket, or further away when the team is in offence, and hinder passes when the team is in defense. Finally, the center position is often located near the basket. The main task of this player is to score points during their team's offence. During the defense centers have to prevent the opponents from scoring by, for example, blocking their shots at the basket. Centers also fulfill a major role in rebounding the ball after missed shots of the opponents.

Environment

Players need a suitable learning environment (meso level) in order to develop performance characteristics necessary for playing basketball at the highest level¹². This thesis focuses on basketball players competing in the U14, U16, U18, or U20 category at the highest youth level in the Dutch basketball competition (Eredivisie). All players are selected for the regional training center (RTC) in the north of the Netherlands, as introduced by the Dutch Basketball Federation in 2011. The aim of these RTC's is to create an environment, i.e., a talent development program, in which the performance development of players is stimulated¹³. RTC's offer guidance and facilities for players as ideally as possible. For example, players are provided with good training facilities, medical care, and educational support.

Basketball player

In order to play at the top level of the Dutch youth competition, basketball players need to possess a high level of multidimensional performance characteristics (i.e., anthropometrical, physiological, technical, and psychosocial) which are related to the basketball game². Anthropometrics such as height and weight are of great magnitude in basketball partly due to the fact that it is a contact sport in which players are directly faced with their opponents. The importance of height and weight is demonstrated by Torres-Unda et al. (2013) and Hoare (2000) by showing that the best basketball players were taller and heavier compared to their less successful counterparts^{14,15}.

Besides the importance of anthropometrical characteristics, physiological characteristics are essential as well due to the high physiological demands in basketball¹⁶. Basketball players have to perform different types of movements during a game (e.g., sprinting, dribbling, passing, shooting), with a change of movement every 2-3 seconds¹⁶. This indicates that speed and change-of-direction speed are important skills for youth basketball players¹⁷. Research has confirmed this by showing that elite players are faster on sprint tests compared to non-elite

players¹⁴. Moreover, repeated sprint ability is a key factor in basketball due to the intermittent character of the game. Repeated sprint ability consists of maximal sprints of short durations interspersed with little recovery in between¹⁸.

Especially typical for basketball is that players are able to maintain their speed while (repeated) dribbling with the ball. This technical skill is discriminative between the performances of elite and sub-elite youth basketball players (in favor of the elites), indicating its importance¹⁴. Basketball players should be able to dribble with the ball in a forward, backward, and sideward direction (ball control) to, for example, pass by the opponents on the court.

The last performance characteristics investigated in this thesis are the psychosocial ones, which recently have received an increasing amount of attention within talent development in sports^{19,20}. Self-regulation is one of the psychosocial concepts that appears to be related to excellent performance. A self-regulated athlete is someone who is metacognitive, motivationally, and behaviorally active in his own learning process²¹⁻²³. For example, a basketball player who wants to improve a skill that is highly important for his position has to be aware of his own weak and strong points related to this skill, has to make a plan of how he wants to improve it, and has to monitor his progress and evaluate the results of his plan. Research has shown that self-regulatory skills, especially reflection, are important to realize one's potential^{21,24,25}.

The dynamic character of performance development

The interaction between influences of the game, environment, and player as described above, as well as the influences from biological maturation and self-regulation of learning and training is dynamic, and affects the performance development of basketball players over time. For example, the effects of maturation influence the performance characteristics of players (figure 1.1). The target group of this thesis consists of players from the age of 13 which characterizes them as a heterogeneous group regarding maturational aspects²⁶. Maturation consists of structural and functional changes of the body during the development towards maturity²⁷⁻²⁹. Due to the differences in timing (indicated by the age at PHV) and tempo of maturation, players of the same chronological age may temporarily differ in their anthropometrical as well as in their physiological development^{26,30}.

In addition, players during PHV have an increased vulnerability for traumatic injuries³¹. Dick et al. (2007) showed that knee injuries, for example anterior cruciate ligament (ACL) injuries, are the most common severe injuries in male basketball (i.e., resulting in a loss of more than ten days of participation)³². More than 60% of the ACL injuries occur without contact with other players³². Pivoting, decelerations, and landing from a vertical leap are typical examples of actions in basketball which are risk factors for tearing the ACL³³. Injuries like these can be seen as an unpleasant hindering of the development of players' performance characteristics, as players are not able to train full time for a period^{34,35}. This illustrates the dynamical and somewhat unpredictable character of the performance development of youth basketball players towards the elite

level in adulthood. To minimize the negative consequences of injuries it is highly important to ensure a successful outcome of the recovery process (i.e., return to pre-injury level of activity), in which psychosocial factors might be beneficial.

Objective and outline

The objective of this thesis is to gain insight into the performance development of talented youth male basketball players (aged 13-19) by adopting a multidimensional and longitudinal approach. The main focus of the thesis is on the multidimensional performance characteristics of basketball players in order to facilitate coaches, trainers, scouts and policy makers in the guidance of talented youth players towards the elite level of performance in adulthood.

Figure 1.2 provides an overview of the performance development of basketball players participating in the studies of this thesis (i.e., players who are part of the RTC). The y-axis shows the performance development of players. It is assumed that the performance level of players increases during their development (i.e., the performance level of U18 players is higher compared with U16 players). During the transition from one team to another, players get selected or deselected by coaches and trainers, as indicated by the dashed arrows. As it is well known that few athletes will achieve the top of their sport, due to the rising demands of players and the smaller window of opportunity over the years, the arrows indicating the transition into a higher age category become thinner and lighter²⁸.

The multidimensional and longitudinal approach applied in this thesis is displayed at the x-axis. It shows for each article (chapter 2-7) which of the multidimensional performance characteristics are investigated in which age category. Chapter 2 examines anthropometrical characteristics and the influence of maturity timing (age at PHV) in basketball players aged 13-16 years. In addition, this chapter focuses on the relation between maturity timing and anthropometrics on the one hand, and the specialization of players in one of the three playing positions on the other hand. In the next chapter (chapter 3), the repeated sprint ability of talented youth basketball players will be investigated. Multilevel modelling is used to evaluate the development of repeated sprint ability and to investigate potentially related factors in basketball players aged 14-19. Chapter 4 investigates the reproducibility and validity of a new basketball-specific test: the STARtest. The test aims to measure change-of-direction speed (performing the test without ball) and ball control (performing the test with ball). Chapter 5 continues research regarding the STARtest by examining the importance of ball control and self-regulatory skills in attaining the elite level. In addition, it investigates the development of, and association between those skills in basketball players (13-19 years) of different playing positions. The differences in positions will be further highlighted in chapter 6.

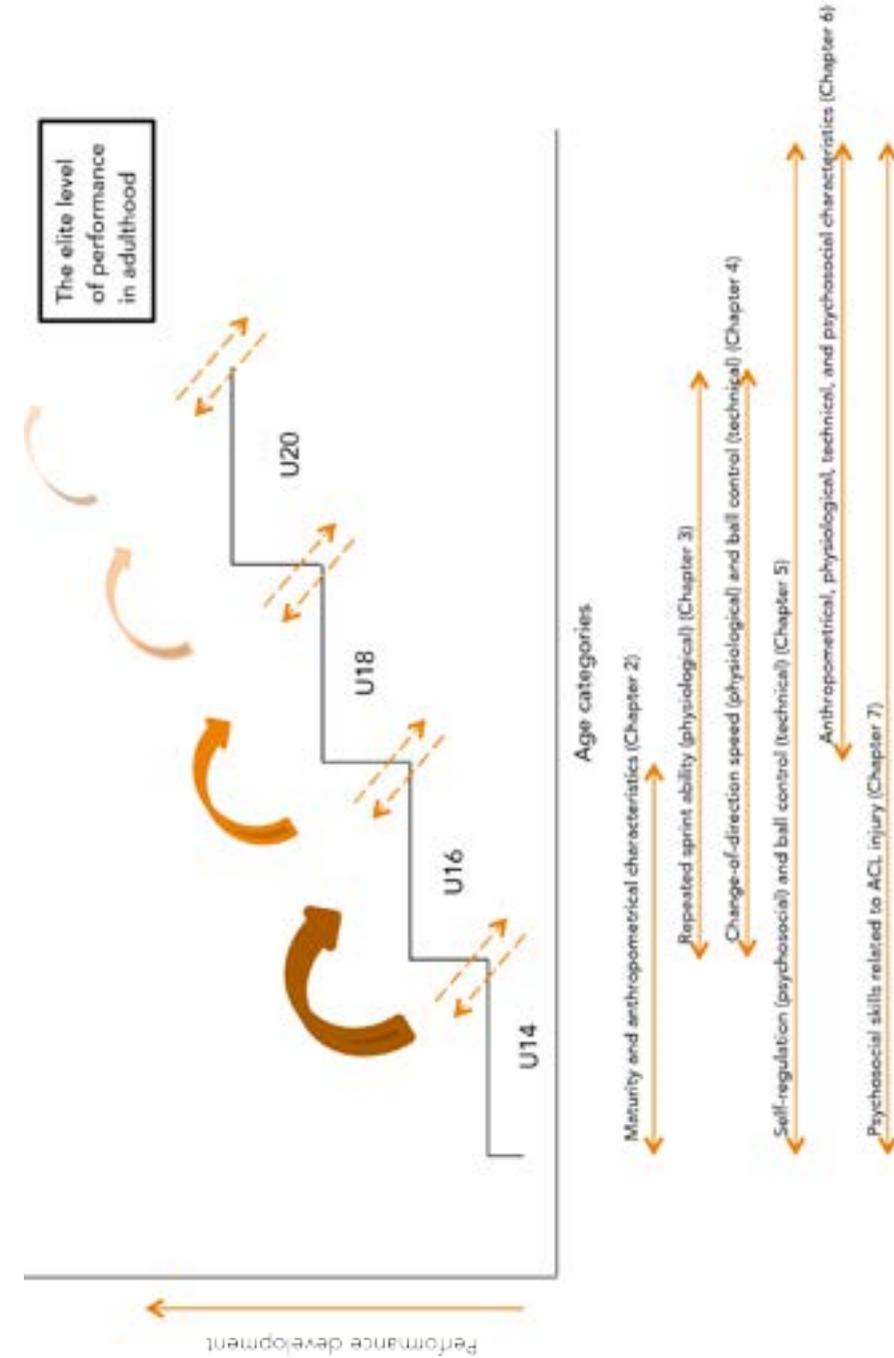


Figure 1.2: Overview of the performance development of talented youth basketball players in relation with the studies presented in this thesis.

This chapter focuses on the identification of position-related characteristics, and, in addition, on the individual differences in performance development of players (16-19 years) who managed to achieve the elite level of performance in adulthood. Furthermore, as injuries seem inevitably related to high performance and may have an influence on the performance development of athletes, the focus of this thesis shifts in chapter 7 towards the recovery of athletes with an ACL injury, i.e., a common severe injury in basketball. The literature review in this chapter provides an overview of psychosocial characteristics which might have an influence on the recovery of an ACL injury. Finally, chapter 8 presents the general discussion of the abovementioned studies and provides recommendations for basketball coaches, trainers, scouts, and policy makers related to the development of talented youth basketball players.

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