Today's talented youth field hockey players, the stars of tomorrow?
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Chapter I

General Introduction
1.1 Expert performance in sports

The ambition of the Dutch Olympic Committee (NOC*NSF) is a permanent top-10 position in the world of sports. To realize this, structural attention is paid to the identification of talented athletes and their development towards expertise. The present study on talented youth field hockey players has been conducted at the Center for Human Movement Sciences of the University of Groningen and is one of many projects to fulfil the above mentioned objective.

Expert performance in sports can be defined as the consistent superior athletic performance over an extended period (Starkes, 1993a). In the present study, expert performance in field hockey is operationalised by playing in the highest league of the Dutch field hockey competition. Dutch field hockey has been ranked among the best in the world for decades and its competition is recognized world-wide for its high performance level. Although reaching excellence in field hockey is not linearly related to the number of invested hours of practice, current international-level performers have spent many hours of training for at least ten years before reaching the top (Ericsson et al., 1993; Ericsson, 1996; Starkes et al., 1996; Starkes, 2000; Van Rossum, 2000). All of them invested enormous amounts of time preparing for the international sporting arena. In the Netherlands, most experts started playing field hockey when they were seven years old. Obviously, youth players who want to make it to the top have to start training already at an early age.

In a review on talent research, Williams and Reilly (2000a) make clear that from a scientific perspective the pursuit of excellence can be broken down into four key stages: ‘talent detection’, ‘talent identification’, ‘talent development’, and ‘talent selection’ (Russell, 1989; Borms, 1996). Talent detection refers to the discovery of potential performers who are currently not involved in the sport in question (Williams and Reilly, 2000a). Talent identification refers to the process of recognizing youth players with the potential to become elite players whereas talent development implies that these players are provided with a suitable learning environment and resources so that they have the opportunity to realize their potential (Régnier et al., 1993). Finally, talent selection involves the ongoing process of identifying players at various stages who demonstrate prerequisite levels of performance for inclusion in a selection team (Williams and Reilly, 2000a). The present thesis focuses on talented youth field hockey players: players who perform better than their peers during training and competition, and who have the potential to become elite performers in the future (Howe et al., 1998; Helsen et al., 2000). This means that the current performance level of youth players is considered important as well as their potential for the future. They are part of a talent development program of a field hockey club of national prestige, and are playing at the highest level for their age category.
1.2 Profile of field hockey

Field hockey is a field invasive sport in which players compete at the same field of action as their opponents (Hughes and Barlett, 2002). To obtain expert status in field hockey, players must excel in no less than four domains: physiological, technical, tactical, and psychological. In addition, the development of their anthropometric characteristics is important. Match analyses at the elite level make clear that field hockey is a high intensity non-continuous game in which the physiological demands are considerable, placing it in the category of ‘heavy exercise’ (e.g., Ghosh et al., 1991; Reilly and Borrie, 1992). Physiological components of expertise include aerobic and anaerobic capacity (Wilmore and Costill, 1999). Specific for field hockey is the intermittent running, e.g. the alternation of accelerating and decelerating, and the many changes of direction while sprinting (Patel et al., 2002; Spencer et al., 2004). The unique requirements of field hockey including dribbling the ball and moving quickly in a semi-crouched posture superimpose the work-load demanded by the game (Reilly and Seaton, 1990). Technical expertise refers to the degree of sensorimotor coordination from which refined, efficient, and effective movement patterns emerge (Janelle and Hillman, 2003). For a technically sound player, dribbling is essentially an automatic process, and the better players distinguish themselves by their running speed while dribbling the ball (Reilly and Bretherton, 1986).

Field hockey is a highly structured analytical game in which players constantly have to deal with a complex and rapidly changing environment (Starkes, 1993b). In order to be successful, they have to perform the right action at the right moment. Therefore, they have to acquire great tactical skills. Tactical expertise is a requisite for expert performance in virtually all achievement domains (Janelle and Hillman, 2003). Sport is unique, however, in that tactical skills involve not only the knowledge to determine what strategy is most appropriate in a given situation, but also whether the strategy can be successfully executed within the constraints of the required movements (e.g., Starkes, 1993a; McPherson, 1994). Thus, the execution of tactical skills in field hockey is always related to the physiological and technical limitations of the individual player, his or her teammates and his or her opponents. To perform at top level, players have to perform under high pressure. It is therefore not surprising that psychological characteristics such as motivation, confidence, anxiety control, mental preparation, team emphasis, and concentration often distinguish elite from non-elite performers (Mahoney et al., 1987; Morris, 2000). Excellent psychological skills can not only play a decisive role in an important match; they are also needed to develop a successful sports career. Commitment from the performers is required since engagement in training is not inherently motivating (Ericsson et al., 1993; Ericsson, 1996).
1.3 Research in sport expertise

For several years, researchers have tried to identify key predictors of talent in many sports. A decade ago, Régnier and colleagues (1993) published a review on talent detection and development in sports with the purpose of providing a better understanding of the process by which one achieves greatness in sports. Until that time, far most studies were cross-sectional in nature measuring general characteristics. Literature on talent identification and development has largely emerged during the 1990s. Books that contribute substantially to our basic understanding of expertise are ‘The road to excellence: The acquisition of expert performance in the arts, sciences, sports, and games’ by Ericsson (1996) and ‘Expert performance in sports’ edited by Starkes and Ericsson (2003). Some years ago, the Journal of Sports Sciences devoted a special issue to talent identification and development in soccer (Williams and Reilly, 2000b).

Research with athletes at the highest level of performance

Sport is characterized by a hierarchical organization in which the level of performance of a player is described by the appropriate level of competition (e.g., local, regional, national, and international). The number of players that are allowed to compete at a given level of competition becomes smaller as the level of performance increases. When players of different competition levels are compared on the basis of their performance characteristics it is to be expected that the higher level players outscore the lower level players. However, this does not necessarily apply when players within the same competition level; i.e., within a talent-group are compared with each other. The relation between multidimensional performance characteristics and level of performance might be different. Therefore, to unravel the mechanisms leading to excellence, research should be conducted within a group of talented players, all playing at the highest performance level for their age. This is possible by comparing elite youth players with sub-elite youth players. Both elite and sub-elite players are part of a talent development program of a field hockey club of national prestige, and are playing at the highest level for their age category. However, in contrast to sub-elite players, elite players additionally play in a youth selection team of the Dutch Field Hockey Association (KNHB).

Measuring multidimensional performance characteristics in a sports-specific way

A group of all talented players is relatively homogeneous with regard to their performance level. As a consequence, measures of general performance characteristics are usually not sensitive enough to detect differences between elite and sub-elite players (Bangsbo and Lindquist, 1992; Lemmink et al., in press 2004). Tests therefore have to measure components
that represent the specific demands of the sport in question involving sports-specific variables (Atkinson and Nevill, 2001). Sports scientists often acknowledge that a world-class performance is the result of several factors, advocating a multidimensional approach in studies on talented players (e.g., Régnier et al., 1993; Reilly et al., 2000). Burwitz et al. (1994) also recommend interdisciplinary performance-related sports science research. Therefore, to allow for the characteristics of field hockey, anthropometric, physiological, technical, tactical, and psychological characteristics should be measured in a sports-specific way.

**Longitudinal research design**

To improve understanding of the factors that contribute to expert performance, players should be monitored over a prolonged period of time (Williams and Reilly, 2000a). By adopting a longitudinal design it is possible to monitor the development of the performance level of talented youth field hockey players. Although the majority of researchers recommend conducting research within a large group of young talented players, measuring multidimensional performance characteristics in a sports-specific way, following the players from childhood to elite senior standard (e.g., Hoare and Warr, 2000; Morris, 2000; Reilly et al., 2000), thus far no study in talented field hockey players combined all these aspects.

1.4 **Objective and outline**

The aim of this thesis is to gain a deeper insight into the relation between (the development of) multidimensional performance characteristics and the level of performance in talented youth field hockey players.

In chapter 2, attention is paid to the measurement of the multidimensional performance characteristics important for high-performance in youth field hockey players. The Shuttle Sprint and Dribble Test and the Slalom Sprint and Dribble Test have been developed for the purpose of this study and a paper on the development of these two field hockey specific tests is included.

In chapter 3, a study conducted within a group of all talented youth field hockey players is presented. To determine the relation between multidimensional performance characteristics and performance level, elite youth players were compared with sub-elite youth players on anthropometric, physiological, technical, tactical, and psychological characteristics.

In chapter 4, longitudinal data are presented on the talented youth field hockey players that have been followed across time. A comparison was made between elite and sub-elite youth players in terms of anthropometric, physiological, technical, tactical, and psychological characteristics measured on three occasions, each separated by a time interval of one year.
In chapter 5, a model of the development of an important physiological performance characteristic, the interval endurance capacity, is presented. Scores on the Interval Shuttle Run Test for interval endurance capacity were modeled for female and male, elite and sub-elite players in the age-band from 12 to 19 years.

The studies on the relation between multidimensional performance characteristics and performance level in talented youth field hockey players, described in the former chapters, show that psychological characteristics distinguish elite from sub-elite youth field hockey players. To investigate whether this finding is specific for field hockey or can be generalized to other sports, a study to reveal the relationship between psychological skills and level of performance within talented youth athletes in field hockey, basketball, volleyball, speed skating, and swimming is presented in chapter 6.

In chapter 7, the measurement of tactical skills is discussed. In the studies described in chapters 3 and 4, tactical skills were measured by the opinion of the trainers. Although these trainers are experts in the field and their opinion is highly valued, one might argue that their judgment of a player’s tactical skills is influenced by their knowledge of that player’s performance level. Therefore, we conducted a study with the purpose of developing a practical, reliable, and valid self-report instrument to measure tactical skills in sports: the Tactical Skills Inventory for Sports.

In chapter 8, the results of the different studies are combined into a general discussion and conclusions are drawn.
References


