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Pushing boundaries for talented athletes

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Talent Identification and Development in Sports Research Group

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1 March 2013
Content

Sports performance in a historical perspective 5
Who or what is talent? 9
Talent Identification and Development in Sports 11
Theoretical framework 15
Research themes 19
Conclusion 25
References 27
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Marije is a human movement scientist and completed here PhD, entitled ‘Today’s talented youth field hockey players: the stars of tomorrow?’, at the University of Groningen. For her research she received the Young Researcher Award (Young Researcher Seminar, Innsbruck, 2004) and the Young Investigator Award (European College of Sport Science, Belgrade, 2005). She was also awarded the NKS Boymans prize in 2006 for the best dissertation in sport. In addition to her activities for the research group, she works at the Center for Human Movement Sciences, University Medical Center Groningen, University of Groningen. Before this she competed internationally in both speed skating and cycling.

Research at HAN: practice-based and innovative
HAN University of Applied Sciences focuses on three objectives: the development of knowledge within the professional domain, the carry-over effect on the study programmes, and the innovation and development of professional practice. The Executive Board at HAN appoints researchers in areas that are relevant for professional practice and the region. To combine as much knowledge as possible and create research volume, the research groups have been bundled into research centres. The Research Group for Talent Identification and Development in Sports is linked to the Institute for Studies in Sports and Exercise at the Faculty of Health and Social Studies. The institute is responsible for the programmes Teacher Education in Physical Education; Sport, Health and Management; Sports and Physical Education; and HAN SENECA. The founders of the research group are drs. Tjeerd de Jong, director at the Institute for Studies in Sports and Exercise, and prof. Chris Visscher, director at the Center for Human Movement Sciences, University Medical Center Groningen, University of Groningen. Through the Research Centre for Rehabilitation, Work, and Sports, the research group provides an innovative contribution to the cycle of research concerning the ability to participate and perform in society.
Sports performance in a historical perspective

The performances of elite athletes are astonishing. They perform seemingly impossible manoeuvres seemingly effortlessly, with grace, speed or great force. Often, these elements are combined and need to be timed with absolute precision. Consider artistic gymnastics, for example, and the skill needed to perform three flight elements in a row on the horizontal bar. Impossible as this may seem, Epke Zonderland showed the world that it can be done, thereby winning the first Olympic gold in the history of Dutch artistic gymnastics. During training, he now is able to combine four flight elements.

All over the world, people feel connected to elite sports. We love to see what our fellow human beings are capable of. Worldwide, football speaks most to the imagination but other sports are also popular. Vast numbers of people watched the last Olympic Games. Large tournaments such as the Olympics are highly valued not only in contemporary Western society, but also in other parts of the world, including Islamic countries. This was illustrated by the fact that, although the Olympics in London took place during Ramadan, this did not prevent athletes from competing. It simply meant a greater challenge for the athletes to perform as best they could. Further, elite sports play an important role not only in contemporary society, but have done for centuries. The modern Olympic Games, founded by Pierre de Coubertin in 1896, have their origins in the ancient Greek world; the first mention of the Olympic Games dates from 776 BC (Bowman, 1986). The cradle of modern sports is in Olympia, an idyllic and remote Greek farming village.

But what many people do not know is that sports existed long before they were reported (Van Wessum, 2003). Paintings on vases dating from the fifteenth century BC reveal that runs and horse races were held in Mycenae. On Crete around the same period there were boxing events and the popular sport of bull leaping, in which the athlete did a somersault on the back of a bull while holding on to its horns (Sakellaraki, 2007). The Greeks practiced a variety of different sports, and although individual sports were most popular, images of team sports have also been found. The first games on record were described by Homer in the Iliad; these were the Games Achilles organised to honour his friend Patrocles, who fell in the battle for Troy. Thus, the most famous poet from ancient times also appears to have been the world’s first sports journalist (Van Wessum, 2003).
Top performances are not achieved by chance. It is impossible to wake up one day and become an Olympic champion that evening without a long and complex process leading up to that day. A rule of the thumb is that it takes around 10 years, or 10,000 hours of deliberate practice (Ericsson et al., 1993), to become a champion. Whether this 10,000 hour ‘rule’ is necessary for every elite athlete is an open question, but it is clear that a lot of time and energy is needed to perform at the highest level in sports. This implies that an individual’s preparation for the Olympic Games starts in their teenage years, and often even earlier. What makes Olympic athletes different from other children? Even more intriguing is the question who of the present generation of children will represent our country at the Games in, say, 2028. Who will make us cheer and dig out from our closets all our orange clothing, decorations and flags? Who will capture our hearts? Whose disappointment will we share in when their performance falls short of our expectations? In other words: with whom will we commiserate in 15 years or so? Who of today’s children will be tomorrow’s heroes? The next question we can ask ourselves is how we can identify these individuals and best help them on their road to the top.

Even though we, as a small country with a relatively small population, do quite well, we can do even better. For instance, we could make important gains when it comes to identifying and developing the talent we have. This research group, which revolves around the young athlete (from the age of 4 to adulthood) within his or her own environment, aims to make a contribution by pushing the boundaries for talented athletes. The Olympic Games are a metaphor for reaching your own top. It is not about attaining an Olympic level of performance in an absolute sense; it is more about seeking your own boundaries, which are different for everyone. The insights gained from talent studies are of interest for anyone aiming to fulfil their own potential.

The overarching aim of this research group is to improve the processes of identifying and developing talented athletes. The group seeks to profile and position HAN in general and the Institute for Sports and Exercise Studies in particular as the knowledge institute for talent identification and talent development. In this effort, the use of the scientific method is the most important instrument. With this, the research group makes a significant contribution to HAN’s profile as a University of Applied Sciences.
To pursue this aim, we:

1. Design and carry out scientific research with clear practical applications. This research results in national and international presentations and publications. A current example is ongoing PhD research on the role of PE teachers in identifying talented athletes.

2. Develop and run educational programmes for students and professionals, such as the minor in Sports Performance Enhancement.

3. Provide community services to schools and sports clubs, such as consulting services for the professional football club NEC regarding the development of talented football players.
Who or what is talent?

Everyone has their own idea of the concept of ‘talent’. Many trainers, coaches and talent scouts say they recognise talent when they see it; they have some sort of ‘Fingerspitzengefühl’. However, what exactly it is that they ‘see’ is hard to put into words. Moreover, they are often mistaken, and it later turns out that top athletes have been overlooked when they were younger. Well-known examples include the Brazilian football player Ronaldo and the world’s best basketball player Michael Jordan. There are even more examples of athletes who have been identified as being talented but never make it to the top. Yet, these athletes are unknown among the general public. The concept of ‘talent’ therefore remains a mystery, with many different definitions. In ancient times, talent meant ‘a great amount of money for which someone had to work for many years’. The Van Dale dictionary mentions not just ‘a certain amount of gold or silver’ but also ‘a natural ability; capacity’. In combination, these definitions imply that nature (‘genes’) and nurture (‘training’) go hand in hand (Tucker & Collins, 2012). But what does this mean for the practice of sports?

Do you have talent or can you be a talent? Is talent predominantly inherited or is it developed? Does eternal talent exist? Is talent sports specific or domain general? In the Netherlands children are defined as talented at a particular sport. Almost always, these children perform the best at a particular moment in time; for example, they belong to the best 10% of their age category (Régnier et al., 1993). Within a sport or cluster of similar sports there is an expectation about the age at which the talent trajectory ends and the top has to be reached. This implies that talent trajectories are limited in terms of time. In relation with the available time, the development of a successful sports career depends on which characteristics a child needs to have developed, learned and trained at a certain moment in time (Janelle & Hillman, 2003). Therefore, the relationship between time and quality of development is crucial in processes of talent identification and development. As a logical consequence, the research group works with a definition of talent that takes not only the current level but also the future level of performance into account (Elferink-Gemser, 2005):
**A talented athlete performs better than his or her peers during training and competition AND has the potential to become an elite athlete in the future.**

An important assumption underlies the identification and development of talented athletes. This assumption represents a great challenge for sports practice and sports research.

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<th>Assumption</th>
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The basic assumption underlying all talent identification and development programmes is that talent can be identified and measured (Cobley et al., 2012). This, however, is not easy. It is usually possible to measure the performance of an athlete at a certain moment in time, especially in individual sports in which, for example, the purpose is to identify the fastest competitor. In jury sports such as artistic gymnastics this is more difficult, and with team sports it is even a greater challenge. Who is the better soccer player: the player perfectly organising the midfield, giving the assist, scoring the goal or preventing an opponent from scoring a goal? These examples always concern performances at a particular moment in time. If we also take the perspective of development into account, it becomes even harder. Measuring potential performance – the performance that an individual will achieve in the future – is much more difficult. The basic premise is that it is possible to predict future performance on the basis of personal multidimensional performance characteristics and former performance during youth. Although research in this area is still in its infancy, sports research that tracks talented athletes throughout their entire talent trajectory and maps the development of their performance characteristics can help in this effort (Elferink-Gemser et al., 2011).
Talent Identification and Development in Sports

On the road to the top, talent identification and talent development play a crucial role. 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’ (Williams & Reilly, 2000). Talent detection refers to the discovery of potential performers who are currently not involved in the sport in question, whereas talent identification refers to the process of recognising young players with the potential to become elite players. Talent development implies that these players are provided with a suitable learning environment and resources to help them realise 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. It is clear that talent identification and talent development go hand in hand and one cannot be considered without the other. From retrospective studies, we know that in most sports there are several pathways to the top (Vaeyens et al., 2009).

In general, two main pathways can be distinguished: (1) early specialisation within one sport, versus (2) all-round development within several sports (see figure 1). In the early specialisation pathway, a child focuses on one sport only from young age. In the all-round pathway, the child samples a variety of sports up to around the age of twelve (these are known as their ‘sampling’ years). As the child enters his or her teens, a limited number of sports are chosen (specialising years), and then at the age of around sixteen only one sport becomes the major focus (investment years) (Bloom, 1985; Côté, 1999; Côté et al., 2003). This second pathway promotes versatile development and, compared to the pathway of early specialisation, seems to be as good or perhaps even better when it comes to sports performance in adulthood (Gulbin et al., 2011). However, it does seem to be an advantage if the child is active in the sport or a similar sport at which he or she later excels. Potentially positive effects of the all-round development pathway include an increased chance of the child entering a sport that best suits his or her personal characteristics. It also minimises the risk of dropout due to emotional fatigue as a result of focusing on only one sport (Vaeyens et al., 2009). As a consequence, less talent will be lost. Yet, it remains unclear which skills or combination of skills can be best practiced during youth to increase the chance of reaching the top in a specific sport. The research group aims in particular to stimulate the versatile development of children, and clearly does not advocate talent selections within the sport at ever younger ages.
talent identification and development in sports

With over 4.7 million organised athletes, the Dutch sports system is unique in the world. It is predominantly clustered under the Dutch Olympic Committee NOC*NSF, and consists of 90 national sports federations together representing around 27,000 sports clubs (www.noc-nsf.nl). In the Netherlands, children are trained to become elite athletes by means of a system primarily based on talent identification by the sports clubs and talent development by both the clubs and the federations in the form of district and national youth selection teams. Around 3% of Dutch youth athletes are considered to be talented and are invited as teenagers to join a district selection team in order to fulfil their potential. Less than 0.5% enter a national youth selection. These young athletes are provided with strong all-round trainers, excellent training facilities, medical care and high-level competition. They can improve their own performance by striving to reach that of athletes of a similar or higher level. The goal of providing these extra opportunities is to increase their chances of reaching the top. However, an important part of childhood development takes place before they choose a particular sport or reach the age at which talent selection teams start.

Figure 1. Pathways to the top: all-round development versus early specialisation (based on Côté et al., 2003)
The place to reach all children from an early age and to stimulate their development is at school. Primary schools currently play a minimal role in the identification and development of talented athletes; in our view, there are opportunities to improve these processes. Special programmes, such as Motoric Remedial Teaching (MRT), exist for children who perform at a below-average level. However, such programmes do not yet exist for children who are well above average. This is a pity, as these children should also get the chance for optimal development, ideally in preparation for a talent selection team when they are older. This could be given an important boost by developing and implementing educational programmes designed for young talented athletes to improve their movement and cognitive skills.

If children are erroneously overlooked as being talented (‘false negatives’), they are not provided with the extra facilities of selection teams, which typically decreases their chances of reaching the top. In other words, there is a danger of a Pygmalion effect, also known as a ‘self-fulfilling prophecy’. Especially for a country like the Netherlands, where we have to compete against large nations such as the USA, Russia and China in the athletic arena, this is a risk that we run if we do not have good insight into what exactly talent is and how to identify it. Although most of us realise that we have to nurture the talent we have, to date talent identification in most sports still takes place based on the performance level of youth athletes related to their chronological age (Elferink-Gemser & Visscher, 2012). In other words, the best-performing 12-year-olds enter a selection team of 12-year-olds and then embark on a talent development trajectory. Although this may seem logical at first glance, the present performance level of a 12-year-old is no guarantee whatsoever of his or her future performance level in adulthood (Elferink-Gemser et al., 2011). In practice, a great deal of energy is invested in young athletes who ultimately will not make it to the top (‘false positives’), whereas children with more talent are overlooked and consequently not provided with the extra facilities of youth selection teams. Thus, this research group contributes to sports practice by increasing our knowledge of the identification and subsequent development of talented athletes. We provide people directly involved in youth sports, be they trainers, coaches, teachers, managers or parents, with practical tools to identify and further develop talented athletes. These tools include measurement instruments as well as education and training programmes with corresponding pedagogical and didactic principles.
Output of the research group:

Gaining insight into talent identification and talent development in sports is important to increase the performance level of Dutch sport, but is also valuable for anyone aiming to fulfill his or her potential.

External
- Better identification of talented athletes by professionals in the school and sports setting, meaning that fewer children are erroneously overlooked (false negatives) or erroneously identified as talented (false positives).
- Better training and guidance for talented athletes.
- Increased performance level in the Dutch sporting arena.

Intern
- Increased professional level of HAN teachers and students through application of the scientific method as the key instrument.
- Strong reputation for HAN in the areas talent identification and talent development.
Theoretical framework

Our future winners have a long road to go before they hear the national anthem played in their honour. On the road to the top, they will have to continuously improve their performance. Although it is acknowledged that no developmental trajectory is always straight, their performance over the years must increase. This is depicted by the ‘time’ arrow in the model. It illustrates the stages that a child undergoes, not just physically but also cognitively, emotionally and...
socially. From being a pre-schooler to starting primary school, entering puberty, becoming an adolescent and finally an adult, an individual experiences many things, including an enormous increase in sports performances. This gain can largely be attributed to personal performance characteristics, but the role of chance should not be underestimated. Personal performance characteristics can be divided into anthropometry (e.g., height, body weight, percentage of body fat), physiological characteristics (e.g., aerobic and anaerobic energy systems), technical skills (e.g., sports-specific skills such as dribbling, passing and shooting in football), tactical skills (e.g., cognitive skills such as making the right decision at the right moment), and psychological skills (e.g., performing under pressure). These characteristics are deduced from characteristics of the sports performance. In every sport, they contribute differently to the level of performance. In other words: the relative importance of one performance characteristic in relation to another differs per sport. For example, in field hockey and football the combination of excellent tactical and technical skills is crucial (Elferink-Gemser et al. 2004, 2007; Huijgen et al., 2009), whereas performance in long track speed skating is determined more by technical skills than by tactics (Van Ingen Schenau et al., 1996). In sports such as basketball and volleyball tall people have a clear advantage, in contrast to artistic gymnastics in which it is advantageous to be petite. As a result, the ideal profile of a talented athlete varies from sport to sport.

A child always develops in and with his or her environment. For this reason, the model shows an explicit relationship between the person’s performance characteristics on the one side and the environment on the other. The environment plays an important role in developing these personal performance characteristics, mainly in learning and training the necessary characteristics (Bloom, 1985; Philips, 2010). By mapping the environmental characteristics, valuable insight can be gained as to how talented athletes can best be identified and subsequently trained and guided in their development. Talent development is the result of the continuous interaction between person and environment. This means that parents, but above all teachers, trainers and coaches, should be aware of what children can and want to learn at each stage, and which behaviour relates to this particular phase of life. From previous research we already know that children whose parents emphasise the enjoyment of sports over winning the game are more successful in the long run than children whose parents do not (Visscher et al., 2009). Other research shows that trainers who challenge talented athletes to take responsibility for their own development are more successful in guiding athletes towards the top than trainers.
who take all decisions and leave no room for the athletes themselves (Van Ark et al., 2009; 2010).

Though the road to the top is long, the time talented athletes have to increase their sports performance is relatively short. Those who have a clear goal, are intrinsically motivated and feel successful when they continue to improve regardless of whether they win or lose seem to have the greatest chance of getting the most out of their potential. They take responsibility for their own sports career and score highly on aspects of self-regulation. Other important elements during the road to the top are maturation, learning and training (Malina et al., 2000; Starkes, 2000). Every child has his or her own developmental curve and, as a consequence, there can be differences during the teenage years in physical characteristics and other factors which may disappear by the time adulthood is reached (Malina, 2011). Given the desire to realise optimal talent identification and talent development, the timing and pace of a growth spurt, for example, should not play a crucial role in the selection of talented athletes (Malina & Rogol, 2011). Nevertheless, there are strong indications that this has been the case to date (Coelho e Silva et al., 2010; Valente dos Santos et al., 2012a, b). In addition, in many sports there is still a so-called relative age effect, meaning that children who are born close to the cut-off date are overrepresented in selection teams (Helsen et al., 2012; Musch & Grondin, 2001). One of the risks inherent to this phenomenon is an increase in false negatives and false positives. Concerning learning and training, talented athletes seem to learn personal characteristics such as technical skills better and faster than most of their peers. In addition, they seem to gain more from training than other youth athletes (Toering et al., 2009).

A key concept for effective learning and training which is related to an athlete’s sporting success is self-regulation (Jonker et al., 2010). This is the degree to which an individual is able to learn in an independent, goal-oriented and effective manner by making use of different metacognitive and motivational skills, such as planning, monitoring, evaluation, reflection, effort and self-efficacy (Ertmer & Newby, 1996; Zimmerman, 1986). To this end, success is also related to setting clear and realistic goals, perceived competence, monitoring one’s own development, knowing what to do and how much effort to put in to realise one’s goals, making the right decisions at the right time and, in particular, creating an environment with opportunities to develop as effectively as possible (Zimmerman, 2002; 2006). Above all, cognitive skills seem to play a crucial role in the development of a successful sports career (Jonker et al., 2012) and these success factors are not only important in the sporting arena (Ericsson, 1996; Jonker et al., 2009). An interesting next step is to investigate
the possibilities for the transfer of knowledge from studies on talent identification and talent development in sports to other areas, such as the educational domain. The research group strives for the optimal development of every child within his or her abilities. Its focus is on insight into and promotion of mechanisms that play a role in ‘fulfilling one’s potential’ or ‘getting the best out of oneself and performing optimally’. These are important goals which can be applied to practically everyone and to many domains, be it sport, school, work, music and so on. Insight into these processes can help to better guide talented athletes towards the top but may also be applied to children and young people who develop along more typical lines. We see an important role here for physical education in primary and secondary schools.

In recent years the insight has emerged that it is not just about sporting talent, but that certain personal characteristics are also crucial for other roles in society. Therefore, in other domains, too – such as education – knowledge of self-regulation is of great value. The measurement instrument for self-regulation may be applied at HAN to identify excellent students who are then provided with extracurricular programmes. Consequently, our vision on the development of talented athletes is about much more than guiding and training future elite athletes.
Research themes

The basis for optimal talent identification and talent development is that a child ends up in a sport that suits his or her personal characteristics; in other words, that the sport is chosen in a ‘smart’ way. For this reason, in our research group we work towards well-considered sports advice. Not with the aim of having children specialise early in only one sport, but rather to combine that sport from an early age with other sports. Talent identification takes place during the sampling as well as the specialising years (see figure 3). Predominantly non-sports specific characteristics are important in the sampling years, whereas sports-specific characteristics become increasingly important in the specialising years. As stated before, these can differ for volleyball players, for example, compared to cyclists. In the sampling years a broad programme that challenges children’s complex motoric and cognitive characteristics is considered of great value for talented athletes. In that stage of talent development, the optimal programmes provided by the best PE teachers and trainers differ from those in the specialising years or even later in the investment years, in which training is much more sports specific. As a result of all this, the research group focuses from an applied and scientific perspective on three research themes

Research themes:
’Smart’ choice of sports
Talent identification
Talent development: top teachers/trainers and optimal programmes
A smart choice of sports is relevant not only for talented athletes but for every child. Unfortunately, still not all children are active in a sports club. Children tend to drop out of sports particularly during their teenage years. The reasons for dropping out are multifaceted, but losing the sense of fun in sports is a key one (Molinero et al., 2006). An important question is: why do children stop liking their sports? It may well be the case that this relates to the type of sport they are involved in. Not all sports are equal, and the atmosphere of how people relate to one another can differ per sport. Are children playing the sport that best suits their personal characteristics? If the answer to this question is ‘no’, chances are that they will be less goal oriented, less intrinsically motivated to continue and will probably drop out sooner. This need not be the case if they are active in a sport that better suits their personal characteristics, in which they experience more success and have more fun. From the view of talent development, this is essential. Children can only fulfil their potential if they indeed come into contact with that particular sport and put a lot of time and energy into it. Therefore, we expect that making a smart choice of sports will contribute in the long run to an increased performance level in Dutch sports.

Self-determination theory states that intrinsic motivation for sports is based on three pillars: autonomy, relatedness and competence (Ryan & Deci, 2000).
In order to be intrinsically motivated it is crucial for an athlete to feel that they can influence their own sports participation and to feel at home in the sport setting. In addition, perceived competence plays an important role. If a child experiences success, he or she is more likely to enjoy the sport and to remain involved in it, including during the teenage years. As illustrated in figure 2, sport performance is the result of the combination of personal performance characteristics, always in and with the child’s environment (Elferink-Gemser & Visscher, 2012). In every sport, these characteristics will contribute in a different way to the level of performance (Elferink-Gemser et al., 2012). The ideal profile of a talented athlete therefore differs per sport. Besides, every child is unique and comes with his or her own profile of personal performance characteristics. It seems plausible that children gain from an optimal match between their own characteristics and the demands of the sport. However, scientific proof of this remains minimal, and this is what we in our research group would like to change.

To give children the chance to fulfil and maintain their sporting potential, it is therefore crucial that they end up in a sport that suits their personal characteristics and in which they feel at home. The first step to take in this regard is to design a profile with the key characteristics for each type of sport. To this end, experienced trainers and coaches have been and are being interviewed. In addition, we draw links to the knowledge already present in the literature (Fransen et al., 2012; Vandorpe et al., 2012). The second step is to develop tools to measure the multidimensional characteristics in children that are important for different types of sport.

Anthropometric and physiological characteristics are relatively easy to map. Still, we are aware that giving advice at a young age based solely on such characteristics does not do justice to the child’s abilities, since these characteristics are highly unstable at that age (Bloomfield et al., 1985; Régnier & Salmela, 1987). In particular, further research is required on the measurement of cognitive characteristics linked to different types of sport. In this effort we place the child centre stage: what does the child like to do and what does he or she enjoy the most?

Based on the comparison between the characteristics of the sport and those of the child, a sports recommendation is formulated. This goes far beyond making a physical profile on the basis of which a tall child is advised to play basketball or volleyball and a small child is directed towards artistic gymnastics. It is about understanding the child’s preferences in relation to his or her physical and cognitive characteristics. Does the child enjoy being responsible for his or her own sports performance (individual sport), or does he or she enjoying performing as well as
TALENT IDENTIFICATION AND DEVELOPMENT IN SPORTS

possible together with others (team sport)? Does the child prefer to plan and practice the performance beforehand in a precise manner (closed sport), or does he or she enjoy anticipating and reacting to constantly changing situations (open sport)? The primary goal here is ‘enduring active participation in sports for everyone’, and related to this is the idea that smart sports advice also leads to improved talent identification and talent development. In the combination sport and school PE teachers, trainers and mainly combination functionaries can play an important role (Platvoet et al., 2012), capable of introducing children to a variety of sports with a long-term focus.

If you don’t put on your skates you’ll never become a top skater

What is it that talented athletes can be identified by? PE teachers seem particularly suited to evaluating the capabilities of young children even before they have chosen a particular sport to focus on, not just for talented athletes but for all children. They see children several times a week in an exercise setting and are focused on their developmental capabilities (Platvoet et al., 2010). Nevertheless, there will be differences between teachers as well. What characterises successful teachers? Are these characteristics similar to those that are also important for trainers and/or coaches in sports? There is a great need for knowledge and understanding as to how talented athletes can best be identified. In addition, improvements can be made in creating a challenging learning environment for sports that promotes the development of self-regulation and other capacities. Although talent identification and talent development cannot be disentangled from their context, a great deal remains unknown about what the best environment is, what the best programmes are, and what forms of training and guidance are optimal. How do we know which children are talented athletes with the potential to become elite athletes in the future? In cooperation with primary schools, our research group is developing, implementing and evaluating a measuring tool for PE teachers to identify and develop talented athletes. Important characteristics in this regard, even more so than physical characteristics, are the child’s ability to develop and his or her work attitude. To date, talented Dutch athletes have received little attention in terms of developing their personal performance characteristics up to around the age of twelve, whereas children at these young ages learn fast and a lot. This is not an argument for sports talent selections at ever younger ages, but rather an argument to create a challenging
learning environment for all children and therefore also for talented athletes. Certainly for primary school children, the school seems a suitable setting.

During the teenage years, sports play an increasing role in identifying and developing talent. In cooperation with sports clubs and federations, our research group develops, implements, and evaluates sports-specific measurement tools for trainers, coaches and scouts to identify and develop talented athletes. Once talented athletes have been identified, they can be provided with challenging environments to further develop towards top performance in the future. Our research group therefore aims to develop optimal programmes for children who are above average at various developmental stages. These programmes are general as well as sports specific, with corresponding pedagogical, didactic and methodological principles tuned to the characteristics of the children. An example of such a program is the intervention to improve self-regulation of learning in talented athletes. First, trainers are introduced in the importance of stimulating self-regulation during training. They are the ones applying the intervention in a training setting for 8 to 10 weeks. Every intervention is video-taped and based on the footage trainers are provided with suitable feedback on a weekly basis. In addition, questionnaires and interviews are held with the talented athletes themselves, their sports performances are observed, and the engagement of the parents is mapped. What is their influence on the self-regulatory skills of talented athletes?
Conclusion

Even though we, as a small country with a relatively small population, do quite well, we can do even better. Olympia exists, also in the Netherlands. By choosing the research themes ‘smart choice of sports’, ‘talent identification’ and ‘talent development’ (top teachers/trainers and optimal programmes), the research group pushes the boundaries for talented athletes and aims to deliver a relevant contribution to an increased performance level in the Dutch sporting arena.

The development of the young child up to early adulthood from the context of his or her close environment plays a central role. The basic premise is that fun forms the basis of success and ultimately personal top performance. This is realized by working on clear and realistic goals. To be successful on the road to excellence, not only sports-specific characteristics are important; rather, domain-general characteristics are even more crucial, such as self-regulation of learning. Understanding of talent identification and development is therefore not only of interest for potential elite athletes but for anyone aiming to fulfill their own potential and push their boundaries.
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