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Talent in sports. Some reflections about the search for future champions

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Abstract. The goal of this paper is to look into the issue of talent identification in sports. Over the last decade researchers tried to get a better insight into how future elite athletes can be selected at young age. The findings reported in this review reveal that elite athletes originate from an optimal combination of intrinsic competences (*e.g.*, physical, technical, psychological) and extrinsic, contextual factors (*e.g.*, training, parents). The identification process that focuses on measuring intrinsic competences should be multidimensional in nature. Moreover, valid interpretations of the potential of the youngsters require longitudinal testing. Finally, the best talent detection program will be useless unless a high quality follow-up is guaranteed through well-designed training programmes in which coaches and PE-teachers play a crucial role. Therefore, the interaction and cooperation of coaches and scientists offer great opportunities to advance the knowledge in the area of talent identification.

Key words: Talent detection, talent development, sports

Résumé. Talent dans le sport. Quelques réflexions sur la recherche de futurs champions.

Le but de ce papier est de se pencher sur la question de l'identification de talent dans le domaine du sport. Au cours de la dernière décennie les chercheurs ont essayé d'obtenir un meilleur aperçu de la façon dont les futurs athlètes d'élite peuvent être sélectionnés. Les résultats présentés dans cette étude révèlent que les athlètes d'élite proviennent d'une combinaison optimale des compétences intrinsèques (par exemple, génétique, physique, technique, psychologique) et extrinsèque (les facteurs contextuels comme par exemple, l'entraînement, le coaching, le support des parents). Le processus d'identification qui se concentre sur la mesure des compétences intrinsèques doit être de nature multidimensionnelle. En outre, des interprétations valides du potentiel des jeunes exigent une approche longitudinale. Enfin, le meilleur programme de détection de talent sera inutile, sauf si une qualité de suivi est garantie grâce à des programmes de formation bien conçus dans lesquels les entraîneurs et les professeurs d'éducation physique jouent un rôle crucial. Par conséquent, l'interaction et la coopération des entraîneurs et des scientifiques sont essentielles pour faire progresser les connaissances dans le domaine de l'identification des talents.

Mots clés : Détection des talents, développement des talents, sport

1 Introduction

It goes without saying that talent identification attracted a considerable amount of attention in the last decade. One of the principal reasons for this increased interest is certainly the pressure coming from the field itself. Coaches and clubs are eager to spot the talented athletes as soon as possible to incorporate them in their teams and provide the proper support and training to develop their talent (Abbott & Collins 2002). This early search for high potentials can even provoke a hefty competition, as Martindale, Collins and Abraham (2007, p. 187) suggested when comparing talent identification and development to big business. Be it as it may, we can fairly state that the global race for talent has been lifted to a higher level of acceleration. This global search for talent has intensified

not only in the business world, but also in the field of artistic culture where creativity rules (Goldstein & Winner, 2009; Livingstone, Lafer-Sousa, & Conway, 2011; Rostan, 2010; Sommerlund & Strandvad, 2012), in education (Matthews & McBee, 2007; Schroth & Helfer, 2009; Trustee & Niles, 2004) and in academia (Wildavsky, 2010). Even though the identification of cognitive abilities (*e.g.*, verbal and analytical skills) has been around for many decades (Renzulli, 1978), the world of sports followed these front-runners in adopting strategies to locate the best players. The question is to what degree scouting systems, test sessions and psychological profiling can be awarded the label of valid and proficient search engines.

Before entering the core of this paper, we want to follow the trail of the anecdote and refer to an interesting TV commercial promoting a French car. Actually the commercial[1] shows a number of famous stars (Salvador Dali, Steffi Graf, Carl Lewis and Bruce Lee) at young age, followed by the clear message that "*when one is born with certain qualities*" – "*becoming the best is only a matter of time*". It is tempting to misuse this statement and consider the whole issue of talent identification as a superficial and redundant process. The message then would be: '*Those who have the potential will prevail'*. Without any doubt, the advocates of the quest for high potentials will argue against such non-strategy and legitimately claim that numerous scientific data have been collected strengthening the identification and selection case. In this paper we will take a closer look at a number of these experiments and discuss the variables that are believed to somehow predict future excellence.

The previous reflections are a clear indication of the different opinions and views that are still present in the talent detection arena. They also provoke some interesting considerations. First, they raise the question to what extent the scientific process of data collection and analysis can be used for talent identification. We believe it is a legitimate expectation that experiments based on solid designs can help to explain the mechanisms bearing a facilitating or impeding effect on performance. Second, they call into question the issue of complexity and contextualisation. Scientific findings cannot shine in splendid isolation, as valid interpretations can only be found in the interaction of many different elements spinning in the contextual web of final performance. Moreover, the need for contextualisation was strongly endorsed in the formative paper of Vaeyens, Lenoir, Williams & Philippaerts (2008). These authors correctly state that talent identification is not just a question of extrapolation from present to future performance. Not only maturation but also the dynamics of the development process interfere with the simple linearity of the prediction curve. It should not be surprising then that, from a methodologically point of view, they stress the importance of longitudinal designs.

[1] http://www.youtube.com/watch?feature=player_detailpage&v=pRR7FK5lIqkAccessed13February2013.

The latter observations emphasize the central role of methodology in performance prediction. In the first section of the present paper we will extend this methodological issue and briefly focus on two approaches. On the one hand the scientific method of systematic and meticulous measurement and one the other hand the intuition mode of the expert coach. The second section will concentrate on a number of studies covering the different competences (*e.g.* physical, technical, tactical, psychological, genetic) that affect future performance. In the third section these competences will be put into a broader perspective, focussing on their dynamic and interactive nature and on the impact of environmental elements (*e.g.* parents, training).

Note that we also want to enlarge the scope of this paper and put it into a broader perspective by referring where appropriate to the talent identification issue in the field of artistic culture. Since talent identification is a major concern in the world of the creative minds, it can be very informative to learn how the high potentials of art are recognized and escorted in their pursuit to conquer famous museums, music halls or theatres.

2 Two individuals, two approaches

Even though the *experience versus experiment conflict* has a generic touch, it is certainly overrepresented in the world of sports. Coaches consider themselves as the experts by experience whereas the sport scientists stick to the strong conviction that only measurements can rightly represent reality (for a more extensive elaboration of this topic see Buekers, 2002). The advantage of the intuitive approach used by the coaches lies in its holistic character. Their judgment focuses on the person as a whole and in doing so integrates the variety of critical elements that determine future performance. The weakness of this appraisal appears to be its subjective nature, even though we have to be conscious that this intuitive judgement is also based on an internal frame of reference build on relevant knowledge.

The scientist then again tends to use what could be labelled partition glasses, dividing the person in a number of quantifiable units. These units are to a large extent based on the specific requirements of the respective sport disciplines and mostly encompass physical, technical, tactical and psychological qualities or competences. Since these competences need to be assessable, tests or test batteries are designed and administered to groups of young athletes and players. The results of these tests are then converted into predictions of the future performance level of these same youngsters. Without any doubt, this approach is drenched with the advantage of its objectivity and as such produces figures carrying a genuine touch of reality. The major problem with these data lies in the fact that they are every so often obtained in their 'splendid' isolation. Since these competences and qualities are frequently tested as separate entities, the predictive value

of these data can be lost in the negligence of their contextual nature. In fact a player can very well compensate for specific shortcomings in one of the competences by being extremely well in another characteristic that is crucial for successful performance (*e.g.*, Tahara *et al.*, 2006).

Until now, comparing the usefulness of both approaches is rather challenging and in itself strongly affected by intuition, as specific studies delving into this topic are almost completely lacking. In this respect the study by Rogulj, Papic, and Cavala (2009) is very instructive as the authors reveal similar results for an approach based on expert opinion and an approach based on morphological characteristics of top athletes. Even though the scope of their paper is limited as only morphological characteristics are used, the data have the merit to open the debate. It is interesting to notice that the authors eventually prefer the approach based on the morphological characteristics of the top athletes, despite the obvious equivalence of both methods.

Perhaps this latter observation, *i.e.*, the choice in favour of quantification when the science *vs.* intuition game is undecided, reveals a tendency to assign higher value to measurable results. For a scientist, this thought is reassuring. However, based on the experience of the long coaching careers of two of the authors, we are convinced that the intuition of coaches should not be considered as meaningless. In contrast, the interaction and cooperation of coaches and scientists offer great opportunities to combine the strength of both actors and advance the knowledge in the area of talent identification.

3 The current understanding

Claiming that the field of talent identification has been the primary focus of investigation in sport sciences is somewhat exaggerated. Yet, the number of scientific papers published in the last decades reveals a sound interest in this topic. This concern is understandable given the huge benefits that can be triggered by an adequate prediction of future sport performance. It has already been mentioned that the formulation of reliable predictions is far from easy, in particular since the ultimate performance level is not defined by the competences as such, but by the combination of these competences. Or, stated differently, on how these different competences and qualities interact, not only between themselves, but also with the dynamics of environment and time. To further put this into perspective, we want to note that predictions will always carry a risky load as sporting results (the ultimate goal) not only depend on the own competence level but also on the competence level of the opponents.

In the remainder of this section, we will touch upon the most important experiments related to talent identification. To classify these studies, we adopted the rather obvious idea that performance in sports, and most certainly in ball sports, is defined by specific competences and qualities. Many tests have been developed for measuring these competences and the vast amount of studies illustrates the urge for finding valid tools for predictions. However, before entering into the description mode and presenting a synopsis of the relevant literature, I want to bring a very crucial element into the equation, that is to say, the multi-dimensional nature of elite performance. This view is corroborated by Collins and MacNamara (2011) as they articulate that "*It is always good to see reviews, . . ., which challenge the extant, simplistic, monodisciplinary approaches to talent identification and development that are still common in the literature*".

It is very well true that the different competences carry an individual load of determination. Strength, for example, is an extremely important physical quality in practically all sports. Yet, on its own right it will not guarantee elite performance. Players also need, among others, technical skill and the right mental state to reach the elite status. But there is even more, as particular flaws in one or more competences can be compensated for by abundant strengths in other pieces of the performance puzzle (Vaeyens *et al.*, 2008). An excellent tactical insight leading to a perfect position play can still put a slower player in a favourable situation. The data presented in the following paragraphs should therefore be interpreted through the goggles of this understanding. In what follows we will provide an overview of different competences and illustrate with some examples how the given competences are believed to predict future performance. In contrast, the genetic determinants will be more comprehensively elaborated, as this factor is still somewhat underrepresented in the literature regarding performance prediction in sports.

3.1 The physical competences

Most probably the physical qualities of the athletes and players are among the most frequently studied contributing factors of performance (*e.g.*, Falk, Lidor, Lander, & Lang, 2004). Yet, the data were not completely convincing as suggested in the title of a paper by Lidor, Falk, Arnon, Cohen, and Lang (2005) "Measurement of Talent in team handball: The *questionable* use of motor and physical tests". Actually, the authors had to conclude that, except for the slalom dribble test, none of the physical or motor tests was sensitive enough to distinguish between the selected and nonselected handball players. Similar results, showing a lack of discriminative power, were found for volleyball (Gabbett, Georgieff, & Domrow, 2007; Lidor, Hershko, Bilkevitz, Arnon, & Falk, 2007). A final case pleading for reticence is presented in a study by Re, Correa, and Bohme (2010) as they stipulate that anthropometric characteristics and physical capacities should not be overvalued during early development.

In contrast to these findings support for the predictive value of physical qualities was found in other studies. For example, based on better scores for speed, agility and

strength for elite youth handball players, Mohamed *et al.* (2009) argued that anthropometric, in addition to performance measures were useful tools for talent identification in youth handball. This finding was supported in a study by Debanne and Lafayye (2011), who found a positive relation between general anthropometric measures and throwing velocity.

Another, at first sight paradoxical example is described in a paper revealing the benefits of a deficit (Livingstone *et al.*, 2011). While painters are confronted with poorer stereopsis than the normal population, this deficit turns into a benefit for painters because it guarantees a more prominent role for the monocular depth cues such as shading, overlap and perspective. This phenomenon of turning so-called disadvantage into specific assets is also present in sports. Just think about the body weight of jockeys, or the ectomorph body composition of marathon runners. The body dimensions of these athletes makes them poorly suited for ball games or decathlon, yet makes them fit perfectly well for horse riding or long distance running. As Vaeyens *et al.* (2008) argued, the nature of the sport discipline itself defines to what extent the uni-dimensional components intervene. For instance, for rock climbing Magiera *et al.* (2013) found that the physiological and anthropometric characteristics explained 38% of the climber's performance capacity. For elite snowboarders, the predictive value of the results on a test battery comprising physical tests (*e.g.*, aerobic capacity, balance, isokinetic power) was even higher as it explained more than 60% of the variance of snowboard performance (Platzer, Raschner, Patterson, & Lembert, 2009).

Moreover, even within specific sport disciplines, the physical requirements will vary strongly, depending on the position of the players on the field; This position-specific adaptation has been observed for various sports, including volleyball (Sheppard, Gabbe, & Raebery, 2009), handball (Zapartidis, Kororos, Christodoulidis, Skoufas, & Bayios, 2011), and rugby (Delahunt *et al.*, 2013).

Till *et al.* (2011) also turned to the game of rugby to examine the anthropometric and performance characteristics influencing the selection of players for the regional and national teams. Original in this study was the fact that possible differences for anthropometric and performance characteristics were controlled for chronological age and maturation. Although the data showed better results for the national players, the authors sticked to the conclusion that given the small differences, the physical attributes only partially contribute toward national selection.

To conclude this section, the least to say is that the findings are equivocal and do not permit an outspoken conclusion, except for the statement that although physical qualities can make a difference they need to be considered in relation to the requirements of the particular sport discipline.

3.2 The technical competences

At first sight it appears evident that youngsters showing superior technical skill would prevail and are designated to become part of the elite circle. The study by Gabbett *et al.* (2007) adds some support to this assumption as it revealed the discriminating power of passing and serving skills for junior volleyball players competing for selection in a talent identification programme. Note that these authors did not find any differences for the physical competence (see section 3.1). Similar results are found in other studies (*e.g.*; Ali, 2011) placing the technical skills upfront in the talent detection process. However, not all technical skill test were able to discriminate between elite and sub-elite players (*e.g.*, Reilly, Bangsbo, & Franks, 2000), indicating that a careful selection of tests is needed.

As we mentioned in the introduction, we also want to strengthen our case by referring to talent identification in the field of artistic culture. As far as the technical component is concerned, a paper by Rostan, Pariser, and Grüber (2002) is very instructive. In their study the authors compared the artworks (drawings) of children with a strong training in the visual arts and children without such a training with the juvenile artwork of acclaimed Western artists (*e.g.*, Klee, Miro, Picasso, ...). The results of this expert appraisal showed that the juvenile artwork of the acclaimed artists clearly differed from the work of the contemporary children. Actually the juvenilia had a higher score on technical skill than art students, while this latter group outperformed the non-art students. These observations illustrate a rather generic trend namely that initial technical skill defines (to an important degree) final quality. It is important to note here that one needs to take into account the possible confounding influence of the "Matthew effect". Young athletes who demonstrate high skill levels at young age, will more likely be selected for skill development programs, thus self-fulfilling the prophesy that they will maintain a higher skill level at later age.

3.3 The tactical competences

"When the brain starts moving, tactics define the game". This statement is helpful to highlight the vital role of tactical decisions and strategic behaviour for successful results. Elite performers, in particular in ball games, are obviously able to take split second decisions to favourably solve the most complex situations. Note however that tactical behaviour depends to a large extent on the technical proficiency of the players, showing once again that the different competences can only materialize on the field through their mutual interaction. Instructive in this respect is the study of Nevett and French (1997), revealing an impact of skill level on tactical decisions, as young baseball players did not mention tactical solutions for which the required motor action was not available in their

movement repertoire. Even though this notion was challenged in a recent paper by Bruce, Farrow, Rainer and Mann (2012), it remains clear that technical limitations will narrow the tactical execution range of the players, even if they are capable to perfectly read and conceptually solve the game situation.

Even though this introductory remark is sufficiently explicit, the talent detection studies focussing on tactics are rather limited as compared to their physical and technical counterparts. Despite this narrow tactical playing field, the study of Kannekens, Elferink-Gemser and Visscher (2011) can be used here to illustrate the significance of tactics in the talent detection process. The method used by the authors can be portrayed as ingenious as they assessed the tactical skills of elite soccer players when they were young and then used these data to compare the players who finally reached the professional performance level in adulthood with those who became amateurs. The most prevailing finding was that players who excelled in the tactical elements positioning and deciding had a significant higher chance to reach the professional soccer level. It is worth mentioning here the study of Savelsberghs, Haansa, Kooijmana, and van Kampen (2010) who found differences between the visual search patterns of selected young soccer players, showing that tactical tests can be valid instruments to increase the validity of the selection process.

3.4 The psychological competences

In the last decade the awareness gained ground that psychological competences represent a critical hurdle that needs to be crossed by the athlete to become a high level competitor. An attractive illustration of the impact of psychological characteristics on top level performance is presented in the study of Gould, Dieffenbach and Moffett (2002). Interviews with Olympic champions, their coaches and some significant others revealed that these athletes were able to take advantage of a number of specific psychological qualities, including confidence, optimism, mental toughness and coachability.

Illustrative in this regard is the study of Weissensteiner, Abernethy, Farrow, and Gross (2012) on the characteristics of expert batsmen. The results of their study indicated mental toughness as the only discriminating psychological attribute between skilled and less-skilled batsmen, provoking a rather cautious comment from the authors that if mental toughness can be reliably predicted at an earlier age it would be useful to integrate this attribute in talent detection tests (Weissensteiner *et al.*, 2012, p. 74). The fact that this study illustrates how relevant psychological attributes are for elite performance is an important finding as it adds an element in the matrix of talent identification. Since a mix of attributes, skills and competences are required for high performance, testing should leave the one-dimensional arena and focus on a multidimensional playing field. The next paragraph will briefly focus on this concern.

3.5 The multidimensional approach

The examples given in the previous sections were in essence conceived as one-dimensional studies, or at best as studies implying only two or three competences. Even though these types of studies expand the body of knowledge on talent identification, their actual practical usefulness is lessened by the limits of their deliberately pursued segmentation. For this reason a multidimensional approach is more appropriate to fulfil the task of finding future talent, since it represents more accurately the different underlying factors that define elite performance.

As we mentioned before, a strong case against the uni-dimensional approach can be found in the paper of Vaeyens *et al.* (2008). Following up on their proper argument, Matthys *et al.* (2013) used a multidimensional approach to study performance characteristics in youth handball. A combination of good skill and excellent endurance appeared to be crucial factors. Apparently Elferink-Gemser, Visscher, Lemmink, & Mulder (2004) were sighted in this matter, as they studied the relation between performance characteristics and performance level in talented hockey players. Elite and sub-elite players were tested on anthropometric, physiological, technical, tactical and psychological characteristics. Multivariate analyses showed that the elite players outclassed their peers for the technical, tactical and psychological variables being better in the slalom dribble, the possession of the ball, and motivation. Apparently it is the combination of these factors that defines the potential of the player. Similar observations were made by Burgess and Naughton (2010, p. 103) as they state: "understanding the multidimensional differences among the requirements of adolescent and elite adult athletes could provide more realistic goals for potential talented players." According to these authors the investment in talent identification and development is worthwhile as long as the talent development models incorporate a large number of variables (*e.g.*, physical, psychological, relative age, game sense) that relate to the different requirements of the final game.

3.6 The genetic determinants

Even though for many of us genetic prediction of sport performance seems to be part of the world of science fiction, recent findings in the field of genetic research have shown interesting new developments. In fact, some studies are suggesting that genetics have a direct impact on athletic performance (Yang *et al.*, 2003; MacArthur & North, 2005; Bray *et al.*, 2009). For example, the ACTN3 gene – the fast-twitch muscle function gene that is found

in leading sprinters – may help to predict if a person would be better in power/sprint or endurance sports.

It is not difficult to understand that genetic sport performance tests could be of interest for professional sport teams to know if their players have the "performance gene" they need to become a successful athlete. In 2008, a soccer team was considering asking its players to have a genetic sport performance test "to discover whether they have a genetic predisposition to athletic excellence" (Scott & Kelso, 2008). It has to be noted that professional sport teams are not the only ones to have an interest in the genetic potential of their players. Parents often have an even stronger desire to know if their child is blessed with the "performance gene" (Neame, 2009). By knowing if their child is better suited for power or endurance sports, parents believe that will be able to guide their child to choose "the sports they were born to play"[2]. It would lead us too far to discuss in this paper all potential ethical issues related to this type of testing minors, but it raises important issues regarding to what extent parents should have access to the genomic information of their children and whether the 'right not to know' should apply to this type of information. (Borry, Shabani, & Howard, 2014). Moreover, it raises issues with regard to appropriate information concerning the test, including its limitations, and the potential impact and use of the test results.

In addition, given these observations one wonders to what extent the use of genetic testing has the potential to accurately predict future performance. Tucker and Collins (2012, p. 555) state that "*individual performance thresholds are determined by our genetic make-up, and training can be defined as the process by which genetic potential is realised* ". So, a major and logical element in the discussion is that genetic predisposition is not the only determinant of future success. Some of the companies (Genetic Technologies and CyGene Direct) offering genetic performance tests correctly mention that performance depends on other key elements in the environment such as, training, nutrition and motivation[3]. So even if one is able to select a child on the basis of genetic tests, the end result is not guaranteed, as the way the potential develops cannot be read (yet) from the chromosomes. This would require a complete understanding of all the genes that interfere with elite performance as well as their interaction between themselves and the environment. At the time being this endeavour still carries a high futuristic load.

This takes us back to the nature-nurture issue showing that the environment is also a crucial player on the field of elite performance. In other words, the context is as steering as the content. This steering effect of the environment has been nicely illustrated in a paper by Mudrak (2011) who interviewed a number of parents of gifted youngsters. Even though the parental support is a vital element for developing the potential of the child, the results of this study revealed a number of negative effects caused by nurturing practices such as excessive expectations, parental perfectionism or authoritarian style that are less than optimal (Mudrak, 2011, p. 200). Apparently high potential and failure can be intimately linked when contextual factors do not meet the necessary quality standards. We will elaborate this issue in the next few paragraphs.

4 The context

The first impression that comes to mind after completing the overview in the previous sections is its ambivalence. One the one hand the available evidence revealing the relation between specific competences and future performance and on the other hand the absence of an integrated perspective on the problem. As we noted previously, the multidimensional approach (*e.g.*, Elferink-Gemser *et al.*, 2004; Burgess and Naugthon, 2010) is best suited to assemble the required pieces of the puzzle. However, even though the puzzle might be showing a very nice representation of the talented youngster, we should not overlook its static nature. Many different capricious experiences can interfere during a career, making the final success less obvious. For this reason, we want to put the data into a broader perspective.

A suitable starting point for this reflection relates to the issue of the relative age effect (RAE), as it gives a good feeling of the complexity of the identification process.

So what is the relative age effect? As demonstrated by Thompson, Barnsley, and Stebelsky (1991) and an impressive multitude of followers (*e.g.*, Baker & Logan, 2007; Baxter-Jones, 1995), youngsters born early in the selection year are privileged as compared to those born later in the same year. Even though this effect resides in the flaws of organisational decisions, it appears to have detrimental effects on the prospects of young athletes to enter the famous hall of elite athletes. Yet, a recent study by Ford and Williams (2011) challenged the validity of the RAE effect in award-winning athletes. According to the authors, the youngsters born later in the given year were pressed to develop higher skill levels then their "older" opponents in order to survive the system.

Actually, the impact of relative age effects should be attributed beyond a dispute between believers and non-believers, based upon contradictory finding. Figure 1 shows how relative age and training age interact at different points in time and different ages within a highly relevant age segment of talent development. Take for example two individuals born in the same 'year 0', 6 months apart. Both individuals, being born in the same year, will

[2] Baby Olympian? DNA Test Screens Sports Ability. MSNBC 2008 Mar 4. Available from URL: http://www.msnbc.msn.com/id/29496350/print/1/displaymode/1098.

[3] Genetic test may be able to predict the sport your child should play. City News 2009 Jun 8. Available from URL: http://www.citytv.com/toronto/citynews/life/health/Article/print/11149.

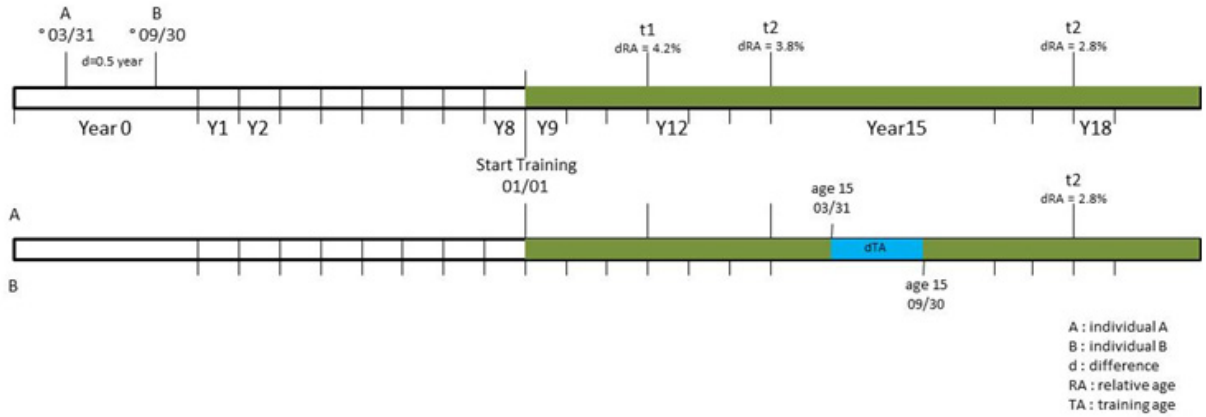

Fig. 1. Confounding effects of relative age (ra) and relative training age (TA).

start practicing at the same point in time, *e.g.* at the start of year9.

When evaluated at a given moment in time, both individuals will have the same training age, as they started training at the same moment, and a difference in skill could, among other factors, be caused by age difference, through physical and neurologic development and all kinds of "life-experiences". Their relative age difference (dRA) at the beginning of year12 is 4.2%, and reduces to 3.8% at the beginning of year15 and further to 2.8% at the beginning of year18. Through their sporting careers, the relative age effect will gradually reduce towards zero. When evaluated at any given age, the younger individual B will always have a higher training age (TA), thus causing an effect opposite to the relative age effect, which in general is considered favourable for individual B. This effect too, will reduce in time, *e.g.* 13.1% at age 12, 7.4% at age 15 and 5 % at age 18. Moreover, in sports where physical development (growth) has a strong positive effect (*e.g.* throwing events athletics, basketball, American football), the relative age effect will be significant and positive. In sport, however, where physical development (growth) can have a negative effect (*e.g.*, female gymnastics), the relative age effect might well be significant and negative.

Finally, we need to bring a methodological issue into the equation. The calculations of Delorme, Boiché and Raspaud (2010) indicated that the accuracy of the test performed in most REA studies must be questioned, because the database of the national population was used as a reference, instead of the database for licenced players. In comparing this latter database for French soccer players with the elite soccer players, the authors revealed that the REA effect was no longer present.

In summary, when evaluating an individual with talent-identification purposes, relative age (generally in favour of the older individual) and relative training age (in favour of the younger individual) need to be considered with caution, not only relative to age and moment in time but also to the given sport. In general, (1) as individuals start training at younger ages, with higher intensities, the relative training age effect will dominate the relative age effect, ipso facto as individuals start training at older ages, with lower intensities, the relative age effect will dominate the relative training age effect, (2) both effects will reduce in time, and (3) the impact of the relative age effect needs to be estimated relative to the impact of physical development (growth) in the given sport.

A second point of interest is elaborated in a paper by Martindale *et al.*, (2007) in which the talent identification and selection process is considered against the background of talent development. Reading their paper had an interesting effect as it brought to mind the image of a snake biting its own tail. Actually, the premise of their thinking is clenched in the following phrase: "*.. while it is clear that talent emerges with the right experience, many still insist on providing funding and development opportunities to only a few selected youngsters, based on correct performance levels*" (Martindale *et al.* 2007, p. 188). This seems to perfectly illustrate the limits surrounding the golden standard of selection. There are famous examples (*e.g.*, Michael Jordan) of passed by youngsters that eventually reach the status of top athlete in spite of the blockades build by the system. Perhaps this can be partly related to the earlier mentioned importance of the psychological concept of mental toughness. Not selecting a mentally tough young athlete might very well trigger higher and long lasting determination to finally achieve. The conclusion of the authors that performance standards are often a poor measure of potential stabs the sword in the heart of the problem. Talent identification is not a question of taking a performance picture at a young age, in which the future is frozen into the limits of the present. Talent identification is a starting point for freeing the potential through welldesigned development programs. This viewpoint is not only adopted by Henriksen (2010), but also placed in a holistic perspective. In his doctoral dissertation *The ecology of talent développent in sport*, this author presents a judiciously elaborated framework

for talent development. A framework that strongly validates the important influence of the environment as the following quote perfectly expresses: "*Athletic talent development is the progressive mutual accommodation that takes place between an aspiring athlete and a composite and dynamic sporting and non-sporting environment*" (Henriksen, 2010, p. 159).

Another elegant elaboration of this talent identification and development issue is provided in the study by Sommerlund and Strandvad (2012). Although this paper addresses the talent issue in the area of artistic culture and creativity (Danish film directors and designers), the reflections of the authors relate very well to our current debate. In fact, the authors try to escape from the dichotomy that defines the reasoning about talent, that is to say, talent in the form of especially gifted persons (the nature issue) versus talent as a social construct (the nurture issue). In contrast they put forward the assumption that talent becomes manifest via specific situations that encompass the potential of the person and various other actors. Thus, talent takes place between the individual, the material and the social (p. 180). More specific the authors discern three distinct phases in the process: *identification*, *self-technology* and *materialization*. It is easy to see the familiarity of the first two elements to the context of sports as they can be linked to identification of the individual talent on the one hand and to the deliberate practice needed for skill improvement (mostly under the supervision of coaches, teachers of parents). The third element is less familiar as it refers to the ability of the talented person to make attachments to other persons (*e.g.*, fans, teammates, sponsors). While this latter capacity is not really incorporated in our thinking, it could actually be a very influential factor for the eventual failure or success of an athlete. Athletes and players do not evolve in splendid isolation but need to function in a world of interaction. Being able to capitalize on these interactions can place the player in a pole position in this contest for victory.

Even though the interaction capacity of the youngsters is mostly left out of the talent detection equation, other contextual factors are recognized and better integrated in the process. This is for example the case for the role of parents as "gatekeepers" for the gifted children (Rostan *et al.*, 2002). According to their research parents appeared to be very objective and valid assessors. This is an important observation as parents are in most cases the first adults to assess the possible presence of talent. However, some caution has to be expressed here as it is also known that parents have the tendency to project their own ideals on the shoulders of their offspring, making their own judgement all but neutral. An explanation of the remarkable Rostan *et al.* findings lies in the protocol used for the assessment of the gifted children. Since the parents were not aware of the origin of the painting they could not give preference to their own child. So it appears that parents can readily recognize talent. However it is far from certain that this capacity guarantees an unbiased judgment when their own children are involved.

5 Conclusion

Talent detection is a very intriguing and inspiring endeavour but also one with a considerable responsibility as those who are involved in this process are shaping the dreams of many youngsters. How positive a selection process may be for those who succeed, the opposite is true for those who fail. The excerpts of interviews in the study from Barnett (2006) reveal the devastating effects of non-selection in a high school dance or cheerleaders team. For this reason the methods, tests and concepts used to detect the gifted individuals should be well conceived. In this respect, we support the argument of Vaeyens, *et al.* (2008, p. 703) that talent identification programs should aim at the potential to develop, rather than exclude children at young age.

The findings reported in this paper reveal three important issues. First, the importance of multidimensional testing. It is a false strategy to select young player on a few competences without taking into account variables that might play a more important role. Athletic performance requires mastering many different skills that are built on their underlying competences. A wellbalanced development of these competences is crucial to future success.

Second, there is a need to test the individual's capacity at different moments in time. Or in the words of Warburton (2002): "*For assessment to tell the whole story, it must get beyond the one-shot-deal administration of a test. What we need are on-going assessments that allow repeated measures over time, so that the development of the person's knowledge and skill can be charted*". The role of coaches and PE-teachers as gatekeepers in this process should not be overlooked.

This brings us to the final observation, namely that talent detection is useless without a strong program to develop the available competences. Only when talent detection and talent development are considered as an inseparable twin pair the full potential of the young athletes will eventually blossom.

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