

**Short scientific review**

## **THE IDENTIFICATION OF TALENT IN SPORT**

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**Abstract:** National federations, sport clubs and other organizations in the field of sports industry set out as one of their primary goals the identification of young athletes who are likely to become top players. Sports clubs have an interest in maintaining the services of their most talented athletes in the long term, for the sake of stability and game quality.

A sports talent involves a complex set of skills that are at the same time genetically determined, dependent on environmental conditions and are difficult to be measured with the satisfactory level of accuracy. Due to the expressed needs of the sports industry for the quality selection of gifted children for sports, but also a growing increase in the competition in the sports market, the identification of talent in sport is a significant problem of modern sports science and its specific challenge, as well.

The reliable identification of future top athletes allows clubs to focus on the development of a small number of players, which represents a more effective management of their financial resources. In an attempt to produce young, talented athletes, researchers in sports have a big role in the cooperation with coaches, scouts and managers in determining the key elements for the identification and development of talents in sport.

**Keywords:** *talent in sport, talent identification, talent development, sports industry*

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### **INTRODUCTION**

Sports psychology does not give a specific answer to the question of the existence of talent in sport. Sports psychologists are divided into two movements, nativist and empiricist. The first movement has its basis in the

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works of Darwin, Galton and Terman who believe that talent is an “innate gift” someone has or has not. The second one is based on the philosophy of Locke and William James, who believe that work and exercise are the bases of results.

In his research in the field of motor learning, Ericsson (2007) explains that it was determined that for achieving the maximum potential in mastering a required skill, thousands of hours of exercise are needed, while sports mastery requires ten years of exercise.

Knowledge in the field of neuroscience tells us that our brain physically changes during the process of acquiring new skills. In the process of adopting new skills our brain creates new interconnections between cells. At the same time our brain produces a substance called myelin. This substance is used to strengthen the newly established connection. The more we practice, the more our brain produces myelin and the connections between cells become stronger. In this way, neuroscience explains the process of adoption of complex motor activities, such as, for example, serving in tennis, dribbling in soccer or high jumping in track and field. The ideas of the Empiricist movement are based on these findings. Scientists believe that with enough practice anyone can reach the expert level in the activities concerned. This belief stems from the classic research on chess players by Simon and Chase (1973) who found that for achieving superior, grandmaster level in chess, 10,000 hours of practice are required, or about 10 years of training. Later, Ericsson et al. (1993, 2007) extended this idea to other sports, developed a model of long-term athlete development and promoted the principle of “training with the intention” (Eng. deliberate practice).

However, this raises an important question of understanding the term of talent in sport, and that is whether anyone who trains hard enough and long enough can become the world’s record holder for example in 100 m? The results of various studies suggest that in order to achieve top results in sport, it is necessary for an athlete to have certain superior physical qualities. It is often pointed (Bouchard et al., 1999) to the necessary functional and morphological characteristics such as an athletic body type, weight, height, arm span, the length of the limbs etc. Different types of muscle fibers are also mentioned as a key factor in achieving superior results in sports (type 1 of muscle fibers - “the slow ones” and the muscle fibers of type 2 - “the fast ones”) and the maximum oxygen uptake (VO<sub>2</sub>max).

### **Previous studies in the field of talent in sport**

Lately, the most popular are genetic researches that are searching for the “sports gene”. Also, even when an athlete has all the necessary physical qualities, that solely will not be sufficient to achieve top results. Today, important names of top-level sport prove the claim that a sports result is

not limited solely to physical constitution, as their talent was previously questioned by the then experts.

Of special interest are genetic studies related to the existence and identification of the talent. Dr. Pitsiladis with his associates (2004, 2007, 2009, 2012) conducted a series of studies that examined 24 gene variants that are commonly associated with sprint and endurance capabilities necessary for running a marathon. In his research, Dr. Pitsiladis tested four world record holders in the 100 meters and five world record holders in the marathon. He obtained the result that the world record holders (when it comes to the combination of the 24 genes) do not deviate significantly from the average. Dr. Pitsiladis examined the demographic characteristics of Kenyan long-distance runners and got some interesting results. Namely, the  $\frac{3}{4}$  of the total number of top Kenyan long-distance runners originate by birth from the tribe of Kalenjin, which makes up 10% of total population in Kenya. At first glance, it would seem that the members of the Kalenjin tribe are in the genetic advantage over the others. But, it was found that they all live and train in the same place (Great Valley Lift). When Dr. Pitsiladis compared the 400 elite athletes with a group of randomly selected Kenyans, he found out that the top athletes have lived in places far away from the school and they had run as children much more often from home to school and back compared to their peers who were not the top runners. Based on these results we can conclude that science still does not know much about the human genome and that the conclusions of the “sports gene” are premature.

One cannot rely solely on genetic factors and argue that someone will achieve top results in sport, just because they have a certain physical predisposition or write off those that do not own physical qualities at an early age. On the other hand, it may be possible that the 10,000 hours of hard and daily work would be enough for a person of average intelligence to acquire a doctoral degree in science, master the skill of playing a musical instrument or to achieve top results in a sport, but it is not advisable to ignore the genetic basis and rely exclusively on long-term exercise. It is more likely to achieve top results in sport by combining genes with a long-term and dedicated work.

However, genetics and training are not the only factors that influence success. Reaching the top results in sport may also be affected by many sociological and psychological factors.

First of all, the influence of family is very important. Bailey and Morley (2006) found out that children who come from complete, but relatively small families, and the children whose parents are willing to engage in their sports activities and invest more time and money to support the children’s activities, as well as the children who come from the middle socioeconomic class are more likely to achieve success in sport. Jean Côté (1999) also got similar results in his research. He found that the role of parents in the development

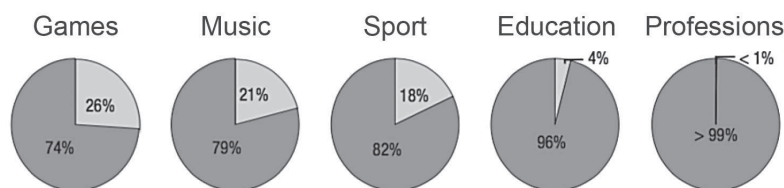
of athletes is very important and that it changes depending on the stage of the sports development of the child.

In the case of psychological factors, a large number of studies (Jones et al., 2007; Randy Wilber, Pitsiladis Yannis, 2012; Jones, G., Hanton, S. & Connaughton, D., 2002) were directed to the determination of the specific personal characteristics of top athletes. So, almost all the researches point out the ability to concentrate, self-confidence and the motivation to train consistently and intensely over a long period of time as integral elements in achieving superior results. In addition, optimism, extroversion, self-esteem, determination and courage are often mentioned, as well.

Nowadays, a very common phrase in the public is “mental strength” (Eng. mental toughness). It is believed that mental toughness is often the factor that decides whether the outcome of sports competitions is to be victory or defeat. According to Jones et al. (2002), mental toughness is a “natural or acquired psychological sharpness that allows athletes to face better the demands of the training sessions compared to their rivals, competitions and professional sports lifestyle, and to maintain a constant high level of determination, focus and confidence, and successfully control their emotions under pressure in relation to their rivals”.

As recent researches are concerned, the largest meta-analysis (a statistical combination of several independent studies) was published in 2014. The analysis includes 88 studies which involved 11,000 people. The results show that the sport practice affects only 18% of performance (Macknamara, B., Hambrick, D., Oswald, F., 2014). The results of the meta-analysis are presented on Graph 1. The light grey part of the graph represents the percentage of the impact of practice on performance.

**Graph 1. The meta-analysis of the impact of practice on performance**  
(Macknamara, Hambrick, Oswald, 2014)



Ross Tucker (2012), a professor and researcher who is known for a practical approach to sports science, in his radio debate with Ericsson (the creator of the theory of 10,000 hours), gave very clear examples that the theory of 10,000 hours is more marketing than reality:

- Height, which is of key importance in a majority of sports, is 80% dependent on the genetic factor. An astonishing number of 300,000 genetic variants account for only 45% of height inheritance. Genetic

evidence is not absent - most physiological factors that are of key importance in professional sport are associated with genes, such as aerobic capacity, muscle fiber types (slow or fast, which is of key importance for the selection of discipline in athletics, those who do not have a high percentage of fast muscle fiber regardless of the amount and intensity of training will never be able to develop speed in sprint as someone who has innate high percentage of fast muscle fiber), risk of injury, limb proportion and height, etc.

- Ericsson (2007) explains performance level as a function of training, and for example only 28% of the variance darts performance is explained by the number of hours practiced, and it means that the time spent in practice is a very poor predictor for performance. The remaining 72% must be attributed to innate factors.
- Certain studies have shown that there is a huge difference in the adaptation to training in various people. A study (Bouchard, 2011) shows that the response and VO<sub>2</sub>max (a measure of aerobic capacity and adaptation to training, and ultimately performance) in some individuals improved by less than 5%, while in others it improved by 30% with the same training. Dr. Claude Bouchard's study with the same theme "Heritage Family Study" which included 98 families in two generations, where the participants were subject to a 5-month training at the stationary bicycle, three times a week and were strictly monitored in laboratory conditions, resulted in following facts: 50% of an individual's starting VO<sub>2</sub>max and 50% of the "trainability" and VO<sub>2</sub>max is heritable; 21 Genetic polymorphisms have been associated with 50% of the training response to VO<sub>2</sub>max.

If a person carries nine or fewer of these 21 genetic variants, then they are low responders and improve VO<sub>2</sub>max by only 200 ml / min (which for a person who weighs 60kg equals to 3,33 ml/kg/min); If a person carries nineteen or more of these 21 variants, then they are high responders and improve VO<sub>2</sub>max by over 600 ml / min, which for a person who weighs 60kg equals to 10 ml/kg/min) and which can be a difference between the winner of the race and someone who ended the run last in a specific discipline of an endurance sport.

It may be concluded that genetic factors impact how we adapt to training. For example, success in running closely relies on factors such as height, limb proportions, leg muscle mass, and other factors that are known to be genetically determined. And so unless you have the right body structure, you cannot have the running economy required to run a marathon in 2.08h because this is a physiology that limits performance, and that we are born with, Ross claims. Of course, the impact of work should not be diminished, and the only way to develop a talent to get into the world top is with a very large number of hours of training.

### **The significance of the genetic heritage for superior results**

The argument that at first glance may support the theory of 10,000 hours is the comparison of the results in sport 50 years ago and now. The results marked a significant progress and most disciplines' winning time from the 1960's would not be enough for qualifications nowadays. So it may seem to the layman that the results are better because athletes train a lot more, as it is certain that this progress cannot be attributed to genetic differences due to the fact that it is a short period of time for human evolution.

However, the reason for progress in addition to the professionalization of sport (which is a major factor) and technological progress, is also a genetic factor, due to the strict selection in different sports. Certainly athletes train more nowadays, which is an important cause of progress, while in the middle of the last century, athletes did not train enough to fully use their potential, because sport was not commercialized and professionalized as it is today, and many of them were not able to earn their living from sport activities, so they turned to other professions.

At the beginning of the last century, there was a view that there is a "perfect body type," which is universal for all sports - "average" height and "average" weight. No matter whether the athlete was engaged in soccer, swimming and athletics, they were supposed to aim for the universal structure. Then the jumper and shot putter were the same height and build, as well as a volleyball player and discus thrower, no matter how unbelievable it sounds.

However, in the last 3 to 4 decades there have been major changes to the "big bang of body type of an athlete" (The Big Bang of Body Types). The average height of gymnasts had fallen from 160 cm to 145 cm during the last 35 years, which clearly shows how genetic predisposition became essential in the field of professional sports.

For today's NFL players, being 1 cm taller or 0.5 kg heavier projects into \$45,000 higher earnings.

Scientists from Australia, Kevin Norton and Tim Olds (2001), were collecting data on the measurements and type of build of athletes for decades and defined the measure titled BOZ (bivariate overlap zone). BOZ indicates the probability that a person can match the type of body that is essential for top performance in a particular sport. Today, less than 30% of people have a proportion of height and weight necessary to become professional soccer players, but less than 10% necessary to become American Football players.

An interesting thing about water polo players in Croatia shows that the average arm length in the period from 1980 to 1998 increased by more than 2.5 cm, while the average arm length of the entire population in Croatia increased by about 0.5 cm over the same period of time. These data demonstrate that artificial selection for professional athletes is becoming more rigorous and

that very few genetic factors have a significant impact at the highest level of competition.

Paula Radcliff is the world record holder in the marathon and she won almost all the marathons that she has started. But at the Olympic Games in Athens and Beijing she had no results. Both runs were held under extreme heat, and that is the reason for her failure. In Athens, she gave up, and in Beijing she finished in the disappointing 23rd place, running 17 minutes slower than her record. The main cause of this is her height of 173 cm. She was a “head” higher than other marathon runners who ran side by side with her. Smaller body is the key to endurance in the circumstances of excessive heat, because the ratio of the surface of the skin and body size determines how quickly the body will radiate (lose) heat. Her proportions are unfavorable to competition in the fierce heat (but favorable for the cold weather marathons, which she won). The winner of the Olympic marathon in Athens, Noguchi’s height is 150 cm - 23 cm less than Paula. Paula’s case is another example that shows how genetic predispositions affect competition, not only in certain sports, but also in certain circumstances.

So far, there have been 23 genetic variants associated with the talent of endurance. Alun Williams and Jonathan Folande (2008) found that some of these variants can be found in 80% of people, and some in less than 5% of the people. Using genetic frequencies, these geneticists used a computer program to calculate the statistical projections of the percentage of people who might be perfect athletes in endurance sports, or who might have two versions of all 23 genes. The results were 1 person in 1,000,000,000,000,000 (quadrillion). This is only an indication that there is no genetically perfect athlete on Earth.

Yannis Pitsiladis has been investigating Jamaicans and their genetic connection with their great success in sprint for a long time. In his interviews, he often says that “If you want to be a world record holder, you have to correctly choose your parents.” Although the sentence is funny because no one can select their parents, it only points to the importance of genetic factors.

Yao Ming is a well-known Chinese basketball player, but it is less known that his parents are intentionally “connected” by the Chinese Basketball Federation. They were both the highest man and woman and both were professional basketball players (against their will), and were chosen by the federation for a “perfect basketball player” – or someone who aspires to be one - to be born. The genetics of Yao Ming is a targeted product and his height of 2.29 meters is not accidental.

### **The identification of talent in sport**

Howe et al. (1996) argue that talent can have several attributes – it can be characterized by traits that are genetically transmitted and partly innate,



but it can also include a range of acquired characteristics. Talent does not need to be visible at an early age, but there are some indicators that will allow for the detection of its presence. Talent is particularly specific in the domain of motor function.

In most sports clubs, talent assessment is based on the subjective assessments of scouts and current material resources. The criteria include acronyms such as TABS (technique, posture, balance, speed), SUPS (speed, understanding, personality, skills) and TIPS (talent, intelligence, personality, speed). The ability of coaches and scouts is not something to be underestimated and the right approach involves integrating patterns in the process, contributing to the objectivity and reducing the possibility of errors.

From the scientific perspective, the pursuit of perfection can be divided into four key stages: detection, selection, identification and development. Detection refers to uncovering of potential athletes (children) who are not currently involved in sport.

Identification refers to the process of recognizing current participants in sports, in order to be selected as the top players. The process involves monitoring different characteristics and performances, some of which may be congenital or subject to the impact of learning and training, in accordance with the requirements of the game. The key question is whether an individual has the potential to benefit from a systematic program of support and training?

Developing talent implies that a player in an appropriate environment has the opportunity to become aware of their own potential. This area of research has recently become very interesting and several leading researchers have indicated that there has been a change of interests - from finding talent to their direction and development.

In the end, the selection of talent implies a permanent process of identifying players at various stages that meet the conditions, the readiness to enter a specific category or a selected team. The selection includes choosing the best individual or group to perform a task in a specific context. This is particularly important in team sports, where more players must be incorporated into an effective whole.

A particular problem in identifying talent is also a battery of tests used in this process. The development of sports science, and primarily the physiology of exercise, succeeded to define a large number of tests for the evaluation of motor and functional abilities of athletes in a scientifically valid way. However, while the motor-functional status is a very important part of the necessary skills to engage in professional sports, it is not the only one.

One of the key differences between elite athletes and average ones is the ability to understand the game, which is the ability to apply cognitive skills in order to solve complex tasks in all phases of the game. Due to serious methodological problems related to the standardization and psychometric



validity of such tests, they are currently impossible to set up. This issue goes in favor of coaches and their feeling in terms of the estimations of tactical-cognitive-inherited traits of athletes.

### **Talent identification programs**

In terms of programs in the field of sports management, and the part related to talent identification in sport and its development, it seems that the UK provides their athletes with the best support system in Europe. Sports institutions and agencies invest large funds into the development of sport and athletes, to ensure they have all the necessary conditions to win medals. This is a sort of targeted investment, focused on developing and investing into those athletes who have the highest potential for success. It seems that precisely this kind of investment gives the best results.

Talent identification programs are multi-phased, from scouting to the analysis and testing of potential candidates.

In the phase of candidate selection, basic physical and motor skills are tested, such as speed, strength and endurance. The selection also includes a detailed analysis of previous coaching of the athletes and the history of their competitions.

Each following phase consists of additional assessments of an athlete's ability to pursue the sport professionally, detailed medical examinations, functional movement assessments, psychological counseling and psychological assessment of behavior.

Then, the selected athletes are subject to a practical test for a period of 6 months up to a year, where their every move on the sports field is closely monitored, any improvements recorded and new assessments of suitability for achieving results are made. Athletes who perform well remain a part of the team whose development is invested into, while the unsuccessful ones return to their clubs and continue their careers in the regular club system.

In the process of identifying talent, the experts of one of the leading football academy, ESA in the UK, who are practically dealing with sports talent assessment, divide talent into four types:

1. **Unidimensional** - Talent excels in one activity or aspect of performance. A good example of this is a 100 meter sprinter who struggles to compete at 200 meters or some other length. In practice, this means that the athletes who fall into this category tend to be limited in their potential and skills.
2. **Multidimensional** - This is where athletes have the ability to combine more skills, they can play football or play tennis just as well. At any point in their play, they are able to combine physical, emotional and non-material skills. Those athletes make major

decisions, change the direction of the game, communicate with the team, etc. They may play central midfield in football, for example.

3. **Unisport** – A top athlete but proficient in only one sport. Someone who is not a multitasking athlete, but has selected one sport and competes at the world-class level. For example, this is Tiger Woods in golf.
4. **Multisport** - A multisport athlete is an athlete who can participate in two or more sports at a top level. Such athletes are encouraged to play in as many sports as they can before choosing to specialize in only one.

Sports academies engaged in the identification and development of talent in sport, emphasize that the indicators of talent are related to skills and decision-making. Skills are:

1. Physical:
  - a) Height and weight, depending on the requirements of sport and players' positions. For example, a footballer will benefit from being tall as it will give them an advantage when contesting for ball possessions, they are likely to dominate in aerial challenges. Also it is desirable for a goalkeeper to be taller than footballers on other positions.
  - b) Arm span: Arm span includes the width of the shoulders and the length of both upper limbs. Many are under the impression that this type of testing is specifically designed for a goalkeeper, however it is important for all players as it helps them in situations like fending opposition players away and protecting the ball.
  - c) Basketball throw: The basketball throw task is designed to measure upper body strength, and is performed with the athlete sitting against the wall and throwing a size 7 basketball as far as possible using a two-handed chest pass. This tests factors such as power, core stability and upper body strength.
  - d) Vertical jump etc., depending on the needs of the particular sport.
  - e) Muscle mass percentage, which is important in any sport and is a good indicator of talent in young athletes, because it defines the power required for sport.
2. The physiological indicators of talent are tests for detecting: a) anaerobic capacity, b) aerobic capacity.
3. Sociological Factors in talent identification are a great influence on young athletes and their potential to become high-level performers. The most important individuals in the circle of influence on an athlete are their coach and parents. Another important sociological factor are the opportunities to exercise, i.e. to train. If an athlete has narrowed possibilities of adequate training, their progress will be slower.

4. Education. In some countries, the education system is the initial step in identifying talent. In schools in the UK, there are programs that are used for the identification of gifted children in both sports and arts to ensure they are properly directed.
5. Psychological factors in identifying talent are also important. First of all, confidence, and trust in own skills and concentration, and the ability to maintain focus.
6. Then, there are also some practical skills such as intelligence in the game, the ability to make quick decisions and the ability of athletes to “read the game“.

## **CONCLUSION**

Top results require a symbiosis of talents and proper long-term work and training. What is called talent is a set of physical and genetic predispositions and the ability to learn and overcome some things faster than other people (both in sports and elsewhere).

Talent is crucial in creating a champion, but only with enormous discipline and work. The notion of work should not be considered without taking into account talent, just like the concept of talent should not be considered without its relation to work. Talent without work is not enough, and vice versa. Without talent, and with a lot of work, the world level could be reached, but not the top of the world level. With talent and without much work, anyone can achieve a remarkable level, in certain cases even world level, but not the top of the world level. This is the essence of the whole phenomenon of talent.

Finally, both talent and hard work, without mental stability, social support, motivation, safety, confidence, commitment, discipline and love for the sport, training and competition do not lead anywhere. Success in sport is a very complex matter and requires absolute dedication. That is why sports results are so highly valued.

Any questions regarding talent and its identification cease to be simple and obvious when it comes to the highest level of professional sports, where minor differences decide about the placement and that is precisely where the smallest details about the controversy surrounding “talent” are recognized.

At that point, it is not enough to be talented and hard-working, but it is necessary to be “super-talented” and to own a special “1 in a 1,000,000” combination of genes. However, even that is not enough - there needs to be a combination of physiological predisposition and a rigorous, methodical and regular long-term training, but also athletes must possess exceptional physical strength and stability.

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