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Review Article

Talent Identification and Talent Optimization

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Abstract

Talent identification and talent optimization are important topics in the world of sports, music and business. It has been proven that practice leads to better accomplishments and that, due to practice otherwise known as deliberate practice, actual changes occur in the brain. This fact has become known as the '10 year rule': training or practicing during the course of a period of 10 years cause a significant improvement in accomplishments and with that also changes in brain tissue. However, if all team members live and train in the same context i.e. each following the same amount of training time as well as the same eating pattern and each spend equal amounts of time sleeping, how is it possible that one member achieves a higher level of performance than the other. This article will not only shed light on the learning processes that improve performance, it will also present an idea (or definition) of what talent is. Talent is the explanation for why some achieve more than others (under the same learning conditions). Top-talents present with an extraordinarily high standard of cognitive skills, primarily in the areas of visual information processing speed and working-memory. Aside from these cognitive skills, the motivational profile of these top-talents was also mapped. It seems that they have certain personality traits at their disposal which enable excellent achievements. In combining excellent cognitive skills with a specific motivational profile, the chances of success are increased. Identifying and optimizing top-talent is a unique process in which clinical neuropsychology seems to be gaining a role of ever increasing importance.

Keywords: *Talent; Expertise; Cognition; Personality*

Introduction

During the last few centuries, increasing interest has been shown in exceptional performance in many fields (sports, music, science, art and business). In addition, a scientific discussion has ensued on whether this could be ascribed to congenital of acquired factors or, in other words: the nature-nurture debate. Galton has taken the stance that ingenuity stems from a congenital skill [1]. Watson however, was of the opinion that acquired factors play a more important role [2]. At the moment we cannot help but think that combinations of congenital and acquired factors are needed to be able to excel in any chosen skill.

When there are differences in performance, there is no evading a process of selection. Agencies in the field of sports, music, art and business, endeavour to spot top-talent as early as possible. In the world of sports one finds that selection of talented players takes place at an increasingly younger age. Up until several decades ago, players made transfers as adults, after having excelled at their own club. Currently the age at which soccer transfers are made occur in the teens between the ages of 14 and 17 years. The motivation seems not solely based on financial gain (junior players are cheaper than established world stars). Also the know-how concerning identifying and optimizing talent has increased considerably. In the case of top musicians, the same principle applies. Talented children are recruited at a very young age. It is common for gifted children (prodigies) to attend a specialized top-class conservatorium. The same procedure is applied to ballet, dance and gymnastics. In business, young people are approached during the course of their study to sign up with companies.

When talented individuals are selected, they will follow counselling and training programmes. These programmes are aimed at developing the best possible skills. The question that should be posed here is: how can one discover talent and subsequently develop and enhance talent to such an extent that he or she can compete at a world class level?

Neuroscience is becoming more and more important in the course of the process of talent identification and talent optimization as described above. This article describes clearly not only why some individuals are capable of such exceptional accomplishments but also the factors which influence them. To summarize: environmental factors /learning (nurture) breed experts whereas talent is congenital (nature). Being an expert says nothing about the presence or absence of talent. Talented individuals attain world-class ranking by combining a naturally high base-line and expert learning processes.

Made instead of born

Watson hypothesized in 1930 that genius was created due to learning processes and that the manner in which a child is raised made him a doctor, artist, vagabond or thief [2]. The information provided by Watson must be held against the background of a period in which an ever increasing flow of information was being accumulated on the subject of learning processes (which subsequently developed into the school of learning within psychology namely behaviourism. This theory states that all knowledge can be acquired and that any level of expertise can only be reached after completing extensive training. The past two decades may be viewed within the framework of learning as congenital characteristics seem to have lost some of their earlier scientific predominance. Twenty years ago Ericsson., *et al*. proved that deliberate practice constitutes the difference between experts and non-experts [3]. The definition of deliberate practice is: to execute an activity with a clear educational component, or: to offer training/education which will develop the required skills aimed at achieving the maximal number of adaptations in response to the training.

Ericsson., *et al*. hypothesized that a minimum of 10 years of relevant training is required to attain the level of an expert [3]. Musicians who practised for 10,000 hours showed a significantly higher level of skill than those musicians who practised less. These same significant results were attained in other fields such as sports and dance. In the meantime Eriksson's theory has become generally accepted. Indeed, many have even accepted this theory as the truth. The main reason being that effects of learning are now objectifiable in the brain; training brings about changes in brain tissue.

Recent studies have shown that brain tissue does not constitute an unchanging mass but rather a dynamic system [4]. Changes can be detected in the cortical representation. It has been ascertained that top musicians who played the piano for years, presented with a greater cortical thickness in de motor areas than individuals who had never played the piano. Studies of cellists show the motor areas of the left-hand (the hand which is uses when playing) to be thicker than those of the right-hand (which isn't). After lengthy tailored finger exercises (10 year rule) changes are noticed in the grey matter of the brain (the cerebral cortex). The areas in the cortex controlling the related muscles significantly increase in size as the musician develops his skills [4].

As time passed, Ericsson's theory however received criticism. Later studies showed that only 34 % of individual differences in performance could be solely attributed to deliberate practice [5]. Therefore it can be concluded that not everything is 'made' but that the influence of genetics might be needed to attain an extraordinary high level of expertise. Such a domain seems to give a more adequate description of the word talent.

'Born' instead of 'made'

Galton's genealogical studies in 1869 proved that certain families produced considerably (Neuroprax 2014; 18) greater numbers of artists, scientists and musicians [1]. This early study already prompts us to make a closer study of the congenital factors which affect human achievement. Cognitive functions and intelligence (both greatly influenced by the congenital factor.) both appear to play a large role in the attainment of the high level of expertise.

Members of our Research Group have worked personally with the best in de world in the fields of sports, music and business. They engaged in conversation with these top talents on topics as the nature/nurture hypothesis, their experiences concerning this topic and the factors they deem as having affected their accomplishments. In addition, they discussed the variables employed by scouts. Remarkably, the same concepts were named as those identified as cognitive domains in scientific literature. Equally remarkable is the conclusion reached by top-trainers that selections made to filter out top-talent are largely based on cognition (mainly speed of thought, insight/IQ, creativity, planning ability, memory) and motivational variables. These top-class trainers indicate that important requirements are speed of thought and the degree to which the player is capable of 'reading the game'. In top-class music conductors indicate they prefer to work with musicians who are quick to familiarize themselves with the music, who have good insight as to the balance of the musical composition and who are quick to discern and grasp the original ideas of the composer.

The congenital factor appears to be a very important measure to attain the status of expert. Global studies on IQ's of chess players and musicians show that a relatively high level of intelligence is necessary to succeed in chess or music careers [6]. Top-talent and their trainers describe the necessity of being able to read the game, having adequate insight in the game and how to handle this insight. These skills may be translated into the cognitive domain known as the working memory. This working memory is made up of the active interaction between saved information (long-term) and prevailing relevant task directed information. Studies of pianists show that the level of working memory can provide the explanation in succeeding in attainment of the expert status [7]. Studies by Ward and Williams indicate that perceptual and cognitive functions (memory) are good indicators for soccer achievements during adulthood [8]. Ward and Williams proved in 2003 that differentiation between elite (English Premier League Academy members) and sub-elite soccer players (school soccer) may be already made at the early age of nine. For obvious reasons, the 10 year rule is discounted in this conclusion.

In recent research Huijgen has proved that a good prediction of success in a later soccer career can be made at the age of 14 [9]. Determinants with a high predictive value for later success in a soccer career were dribbling speed and the ability to make good high speed passes.

Currently we are doing scientific research on many top-class athletes, musicians who attend prestigious conservatories as well as high level business men and women ($n > 350$). Their cognitive profile has been ascertained and currently they are being observed as to differences in performance (the comparison is made between those who have reached the top and those who just did not). To determine which tests to use, subjective factors were taken into account such as those indicated by top-class trainers as well as data extracted from scientific research on top-class talent. These ideas were translated into cognitive domains.

To illustrate, the following example: in our soccer research we studied a number of young players in the 90's. Ten years later, the manner in which the cognitive measures could be associated with the attained level of play was determined (whether they were or were not selected to play for the Dutch team). Measured domains were: memory, visual information processing speed, planning, response inhibition and speed of straightforward response.

The studies show a significant difference between cognitive achievements of players who were and those who were not selected to join the Dutch team (Figure 1). The differences concern mental speed: visual search processes and speed of information processing. In addition, a second study shows that there are cognitive differences amongst players. For this study players of the First and Second Team of a top-class soccer club were compared. Again a difference was noted, this time concerning working memory and speed of information processing (Figure 2). Remarkably, the development of working memory seems to form the strongest relation with the definition of talent as described by soccer scouts.

The most important conclusion that may be reached concerning both studies is that successful soccer players show higher scores on tests that measure working memory and the speed of visual information processing than lower level soccer players do. Talent identification and optimisation can therefore be measured objectively and prove to be useful aids during selection of professional soccer players.

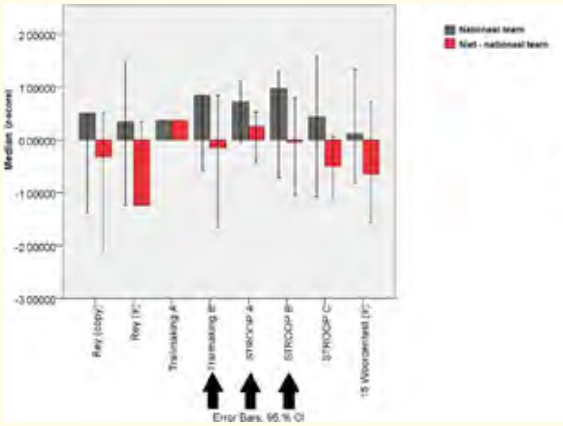

Figure 1: *Research National and Non-national team.*

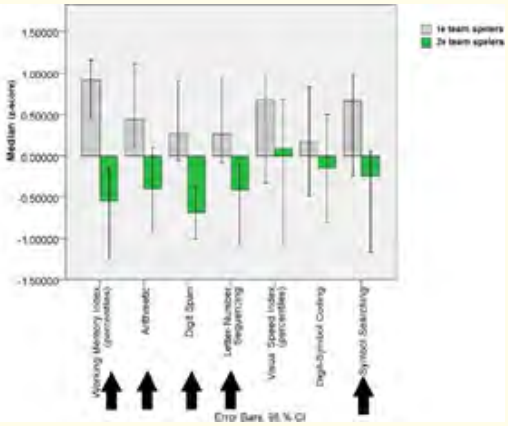

Figure 2: *Research 1st en 2nd team.*

The arrows show the tests in which significant differences were found. (Neuroprax; 18)

Motivational characteristics

The conclusions of the clinician concerning the result of the observations of the subjects will be described in the following paragraphs. The conclusions refer to several observations of high-class soccer professionals. Analysis of the interviews resulted in a clear picture mainly of specific motivational characteristics. To chart the motivational values of top-class talent, a personality test is done. The accompanying model (Figure 2) shows the motivational profile of several (n013) individuals who have reached world class level in sports, music and business. Despite the relatively small number of persons, this framework succeeds in accurately depicting the motivational views on talent often observed during conversations with them.

a) **Modest, selfless versus dominant, assertive:** the professionals indicate that they are prepared to climb the mountain every day. They have their goals defined in a long term vision. They are willing to train hard and use those long term goals to motivate their training. These long term goals appear to play an important part in later being good at and successful in a certain activity. Those who reach the top seem often to want control over their own processes and over the environment in which they function. This could be defined as a high degree of dominance.

b) **Reserved (analytical) versus social:** these individuals are interested in analysis (how is something done or made, what can I use to become even better) and they are less interested in banal conversation (not interested in social chit chat).

c) **Powerful, intense versus patient, relaxed:** furthermore, these professionals tend to often be resilient (quick to recover, powerful personality, bounce back mentality). Trainers that were interviewed state that being able to bounce back or, in other words be resilient, is one of the most important variables that contribute to winning competitions or important tournaments.

d) **Informal, independent versus formal, compliant:** the professionals are capable of thinking out of the box. This creative mentality enables these individuals to function outside of the rules and protocols as well as making use of problematic situations in such a way that opportunities materialize (turning problems into possibilities).

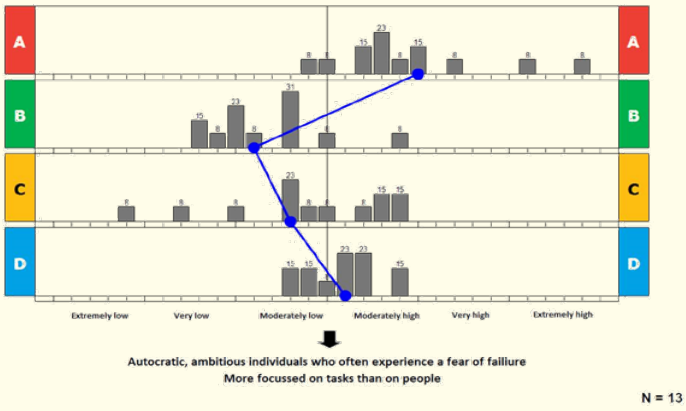

Figure 3: *Motivational characteristics.*

Talent identification and talent optimisation

The same variables are reported in sports as well as science. Research on Nobel prize winners (lecture by Eric-Wubbo Lameijer, 2013) shows that they often used audacious methods (swimming against the current or the out of the box approach), that they were trained by people who encouraged interaction/analyses with others (in other words: encouraged them not to keep all information to themselves, to apply broad analysis) and that they took time to reflect on the issues and to broaden the analysis. The same applies to sports and music. These same personality traits surface in musicians who have won piano competitions, top-class baseball players and athletes who have won Olympic gold medals.

Leadership

In the world of soccer, top coaches indicate that they prefer to work with people who have nimble minds, are creative, are capable of reading the game at a high level and have the right attitude towards hard training as well as being willing to continually set new goals. Potential players must also have a high resilience (be able to bounce back easily). After losing a game, they must be capable of quick recovery and be quickly able to recharge for the following game. Coaches will furthermore choose several 'workers' to fill certain positions on the field. These 'workers' are players who supply a large amount of energy, which optimizes the total game plan of the team.

When compiling a top-class team, the question arises as to who should lead the team, how these processes work and who is suitable. This naturally applies to those on the field (for example captain of a team in sports) as well as to the manager/trainer. Several general principles seem of importance. Leaders should be people who can cope with top-class athletes who seek their own solutions (think out of the box), want control over their own processes and their environment (are dominant) and are focused on analysis (in other words, the profile fitting top-performers). World class talents are seen as 'different' or 'strange'. A good teacher, coach or captain must be capable of coping with these traits. Remarkably, it seems hardly necessary to 'like each other'. A coach is judged by his players on the level of analysis (of the game). When the analysis is incorrect and the team loses their games, irritation arises and this results in damage to the working relationship. Unpleasant/unfriendly coaches, who make good analyses and are capable of adapting their analysis during the game, are approved and accepted by the players. Successful coaching consists mainly of coping with specific personality traits and being capable of applying well-fitting analyses which increase success ratios. Key words within a well-functioning team of talented players are: respect and analysis.

It is of great importance to have insight in 'talent structures'. A dynamic team consisting of talented leaders and several water carriers can achieve maximal success. Talent attracts talent and simultaneously motivates the others.

Along these lines these structures may be elevated to a higher level enabling one to reach the highest level. In the event that a talent finds him-/herself in the position where the talent is not acknowledged or the environment does not handle it well, the talent is destroyed. Highly talented people think differently and are different.

Putting theoretical knowledge into practice: the role of the clinical neuropsychologist

Wrisberg had already suggested in 1993 that study of talent/competency should be interactionistic as well as multidimensional (applied to mental as well as physical traits) and that the relative importance of the factors should be examined [10,11]. The role of neuropsychology is growing steadily. Earlier described variables (cognitive and motivational characteristics) may be objectified by means of clinical neuropsychology. The activities employed to select players for elite teams are no longer merely based on the judgement of scouts (i.e. subjective information). Objective information and motivational characteristics are now also being taken into consideration when making a decision. Scouts from top-class teams are at present collaborating with clinical neuropsychologists. The theoretical knowledge of the clinical neuropsychologist is translated and used when selecting new members and when applying optimization processes in top-class teams.

Identifying talent

Skills such as insight in the game (reading the game), creativity, speed of thought, a high performance level of the executive functions and a nimble mind under pressure for time can all be measured objectively by clinical neuropsychological examination (Neuroprax 2014; 18).

Neuropsychological testing of cognitive functions gives insight into the degree in which these variables are developed. There are several reasons as to why it is important to identify talent at a young age. Studies have shown that variety in training programmes has less and less effect as the level of expertise rises [12].

This implies that talented youths have the most advantage when receiving the adequate training in their early development. When top-class talent is selected at a young age, it is logical that the optimizing of this talent will start sooner. The 10 years of experience needed to achieve the expert status according to the earlier described concept by Ericsson, are therefore reached sooner. A player subsequently reaches the expert status at a younger age which then results in being able to function for a longer stretch at top-class level. In addition the talented player is offered the opportunity to develop at the age at which the most optimal development of the brain takes place.

Talent optimization

Besides objectifying the cognitive skills, research on motivational characteristics has given insight into which circumstances create the most motivation. This helps to make the most of the available skills in the course of coaching a player. After the coach has indicated which 'motivational culture' he wishes in his team, use is made of questionnaires which test personality and motivational characteristics, to select the players.

The optimization process consists of supporting the coach as well as the player. The pitfalls must be clarified and handled adequately. As mentioned earlier, top-class talents present an image of seeming 'different'. For the talents themselves, this describes their nature and they need to be supported to consolidate their skills to reach maximum achievement. In addition the coach needs to know how to stimulate his players. He needs to know them well and understand their strengths and weaknesses. In addition he needs to know how to handle them in order to optimize the talent. Much talent is lost due to underdevelopment, becoming bored and developing emotional reactions which bring the development to a halt (feelings of inaptitude, frustration and despair). Experience teaches us that talents with talent must train, learn and achieve to reach the maximum achievable level. Talent attracts talent (the process of intellectual cross-pollination) whereby society develops a pipeline architecture within the training of sports, music and business. In addition attention must be drawn to the fact that a society driven by protocol suffocates the development of talent. People with a creative mind, quick and flexible thinking

Conclusion

To belong to the best in the world and to be able to compete with them, several ingredients can be extracted from the nature-nurture discussion which seem essential in predicting success. Although many hours of specific training focussed on changing brain tissue are necessary to achieve a certain skill, it seems that intellectual, cognitive and congenital characteristics play an equally important part. Neuropsychological research demonstrates this point, using questionnaires and semi-structured interviews. When people with certain skills (talent) are selected, a training programme should be carried out which will support optimal development of brain tissue, which in turn will optimize the functionality of the skill system being trained. With this in mind one should base one's conclusions on the principles of scientific literature on learning. A clinical talent identification and talent optimization neuropsychologist can be deployed when identifying and optimizing talent as well as composing a specific team culture and aligning different characters to form the most desirable combination for a top-class team.

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