

Talent Identification and Specialization in Sport: An Overview of Some Unanswered Questions

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The theory of deliberate practice postulates that experts are always made, not born. This theory translated to the youth-sport domain means that if athletes want to be high-level performers, they need to deliberately engage in practice during the specialization years, spending time wisely and always focusing on tasks that challenge current performance. Sport organizations in several countries around the world created specialized training centers where selected young talents practice under the supervision of experienced coaches in order to become professional athletes and integrate onto youth national teams. Early specialization and accurate observation by expert coaches or scouts remain the only tools to find a potential excellent athlete among a great number of participants. In the current study, the authors present 2 of the problems raised by talent search and the risks of such a search. Growth and maturation are important concepts to better understand the identification, selection, and development processes of young athletes. However, the literature suggests that sport-promoting strategies are being maintained despite the increased demands in the anthropometric characteristics of professional players and demands of actual professional soccer competitions. On the other hand, identifying biological variables that can predict performance is almost impossible.

Keywords: growth, motivation, expertise, biological model

In the universe of sport, whether team or individual, among the large group of those engaged very few will attain the highest level and can aspire to be recognized as outstanding talents.¹ Talent identification and selection became a central problem for sport science when the competition for international success in sport, namely, the accountability of Olympic medals, became political. The first steps in this direction were taken by the Soviet Union and other countries through extensive and expensive science-based programs aiming to raise the level of performance in every athletic discipline. The rationale behind these enormous investments was that results would improve if the preparation began at earlier ages, the right children were oriented to the sports where their natural qualities best fit, the amount of training under proper supervision raised human limits, and training was scientifically organized and monitored by educated personnel.

The impressive results in international competitions led organizations in other countries to advocate similar detection systems, but forgetting a key element in the Soviet model: full control of the children's lives. Ethical and financial reasons, associated with political changes, caused the discredit and abandonment of state-based talent-selection models but did not undermine the beliefs in early specialization and search for talent.

Recently, the theory of deliberate practice added fresh arguments to the topic of talent identification. The assumption behind the argument is that experts are always made, not born.² This theory translated to the youth-sport domain means that if athletes want to be high-level performers, they need to deliberately engage in practice during the specialization years, spending time wisely and always focusing on tasks that challenge current performance. It seems reasonable that if the young athletes are better selected, have better training conditions, and spend more time practicing and competing with better teammates and opponents, the chance of becoming competent adult athletes would be greater. The 10,000-hours rule and the long-term athlete-development model²⁻⁴ express this perspective, proposing a training volume sequentially balanced through more or less 10 years of sport specialization.

In addition, Chi⁵ argues that the road to expertise means that efforts must be consistently focused on improving weaknesses and producing successful outcomes (winning competitions). Trying to adjust to the deliberate-practice model, many sport organizations in several countries around the world created specialized training centers where selected young talents practice under the supervision of experienced coaches to become professional athletes and integrate onto youth national teams.⁶

The lack of a comprehensive national system of identification, in combination with volunteer-based participation in sport, means that material, social, and

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personal conditions are the main ways of talent detection and selection. Early specialization and accurate observation by expert coaches or scouts remain the only tools to find a potential excellent athlete. In the current study, we present 2 of the problems raised by talent search and the risks of such a search.

Growth and Maturation

Many studies highlight the biological variability in youth sport.⁷⁻⁹ A common line between all these studies is the conclusion that grouping children and youngsters according to their chronological age causes a discrepancy, where the more advanced in maturity get a substantial advantage. On average, more mature boys and girls are taller and heavier than their peers of the same chronological age, which gives them a huge advantage in sports that include physical contact. It is between 11 and 16 years of age that we find the greatest variation in maturational status between youngsters. There is a strong link between maturational development and growth and performance. Organizing age groups by chronological age leads to big differences in size, body composition, and performance. Adolescence is the period when these differences are more visible; 13 to 15 years of age seems to be the most heterogeneous period.⁸ In the same age group, more maturationally advanced subjects are in general heavier and taller than their peers of the same chronological age from childhood until the end of adolescence. However, adults do not usually show the same differences when the same comparison is made. This situation can be explained by the catch-up phenomenon in late-maturing individuals. Biological variability in the developmental period and its consequences on body size and shape were described by Malina et al¹⁰: until 13 years of age, average maturity is the most representative maturity category, and late and early maturers tend to be equally represented; there are almost no delayed players in the oldest age groups (under 17 and under 19). With age and probable increase in experience, the more maturationally advanced players tend to dominate the game; data suggest that sport systematically excludes more delayed players in favor of those who are average and, especially, those who are advanced.¹¹

The initial process of identifying promising athletes is multidimensional, and the literature in this area shows that growth and maturation are 2 important concepts to better understand the identification, selection, and development processes of young athletes.¹²⁻¹⁵ Usually, young players are above the mean for their age in height and mass and tend to be advanced in biological maturity with increasing age during adolescence and in elite development programs.¹⁶ The worst results have been reported for body size and functional performance in young soccer players who were not selected to play in more demanding competitions¹⁷ or who dropped out from sport.¹⁸ The same trend was visible in academy players who were not extended professional contracts.^{15,19} Despite of the lack of evidence that anthropometrical, maturational, and physical characteristics in the beginning of the process

are not directly associated with exceptional performance in the adulthood,²⁰ it is interesting to understand that these indicators may open the doors of academies and other training centers of excellence promoting better conditions and better coaching to the selected players. Recently, Carling, Le Gall, and Malina²¹ found no decennial differences in the entrance profiles of soccer players in a club academy. This suggests that the sport-promoting strategies are being maintained despite increased demands in the anthropometric characteristics of professional players and demands of the actual professional soccer competitions.

Search for a Biological Model

Sport scientists never gave up the goal of identifying young talents for specific sports and of building a prediction model for success in adult competitions, but the obstacles are multiple and apparently without satisfactory solutions. The multidimensionality of sport performance and the variability of competences needed to be a top athlete mean that the number of variables able to fit an explanatory model of future performance is enormous. Sports like team games, with open game situations demanding complex abilities in confronting different opponents, demand a tactical excellence to succeed in competition, making it impossible to identify biological variables that can predict performance. It seems plausible that in less complex sports such as track and field, swimming, or rowing it would be easier to establish a consensus about the key biological variables able to predict potential success.

It is commonly accepted that metabolic capacity can be modified by regular training. Nonetheless, the maturation process acts as a very confounding factor. Aerobic capacity increases through childhood and adolescence. The peak improvement in $\text{VO}_{2\text{max}}$ matches the peak of height and weight velocities, the increase in fat-free mass, and the hemoglobin content of the blood, which are maturation-determinant factors.²² Anaerobic power increases at the onset of puberty,²³ with boys showing lower anaerobic results than adolescents.²⁴ Once again, the lower muscle mass is strongly related to the maturation process. Growth-hormone release is greater in pubertal than prepubertal subjects, which reflects the influence of maturation on the rising of sex-hormone concentrations.²⁵

The influence of regular sport training on metabolism can often be seen in youth athletes. In 11-year-old boys, endurance-training programs can increase both succinate dehydrogenase (SDH) and phosphofructokinase (PFK), involved, respectively, in oxidative and glycolic pathways, while at 16 years of age boys' endurance training improves only SDH and sprint training increases PFK but not SDH. However, in both groups, discontinuing training returns the enzymatic values back to baseline levels.

Strength development could be related to the maturation process of testosterone production. Data show that boys reach peak gains in strength 1.2 years after peak height velocity, and girls, earlier, at 0.6 years after

peak height velocity. However, strength training during prepubescent years may also increase the concentration of testosterone and promote strength at young ages.²⁶ In general, physiological parameters depend on maturation status, which makes them poor markers for sport-selecting strategies.²⁷

Several attempts have been made to explain performance and select the most predictive traits or states in young athletes. For example, in a longitudinal study with a large group of young Portuguese swimmers (494 boys and girls age 13–16 and 12–14 y, respectively), the only parameter that showed to be correlated with performance and predict it in competition was the ability to maintain a fast velocity over 30 minutes. As one could easily interpret, a test like this is strongly dependent on training load (distance swum and number of training sessions). Despite the several algorithms used in the regression models, the expected prediction was under 65%. Hence, there is space for many unexplained factors that could affect performance capacity in a particular moment in any athlete and sport.²⁸

The role of heritability assumes a new interest in talent identification. However, due to its complexity, it is not yet possible to identify consistent models taking into account the large phenotypic variance that can explain future performance.

Conclusions

Recent studies have shown that motivation is a more important variable to differentiate elite young athletes from nonelite ones than are athletic readiness or skill proficiency.^{6,18,29,30} From an anthropological point of view, Malina¹ showed that readiness for sport performance is a matter of timing, demanding years of adaptation to higher intensities and volumes and stressful situations. Hence, talent identification is a long process, and the earlier a decision is made, the greater is the uncertainty about the outcome. Recent trends to start specialized training before puberty raise the risk of injury and are no guarantee of success.

Human performance in sport has shown a constant improvement in recent decades, despite the lack of a reliable model to identify the fittest at younger ages. It seems that a good sport and educational system, providing opportunities for all and the necessary autonomy to choose our own way at the right time, continues to be the best talent-identification model of all.

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