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Original Article

Understand well to develop better: gifted students in physical education and sport

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Abstract:
Introduction: The traditional view of gifted students in education emphasizes cognitive skills and academic excellence. Practical subjects like physical education and sports have an underestimate role in their inclusion. Moreover, the diversity of concepts used as synonyms (without being so) leads to widespread confusion that does not benefit this type of student. **Objective:** The aim of this narrative review is analyzing the different models of identification of talent to contribute to the optimal development of gifted students. **Method:** This narrative review combines theoretical analysis and reflective insights to explore the role of physical education in socially including gifted students. Engaging with expert literature, the authors propose a holistic educational approach that employs physical education to foster cognitive abilities beyond motor skills. The study discusses two dimensions: (a) models for identifying and developing gifted students, and (b) the contributions of these models to their optimal development. **Results and conclusions:** 10 theories concerning gifted/talented students' identification and/or development are presented and share key elements. They adopt a holistic approach, recognizing cognitive, physical, emotional, and social aspects. Interaction between individuals and their environment is emphasized, especially in sport field, with models like Bloom and Gilbon model highlighting gradual progress. Ericsson's theory underscores commitment and practice. Models like Gagné and Balyi stress individual differences. All theories view talent as evolving, not innate. Choosing a model depends on goals and students. Combining approaches from different models might offers a holistic view. Educators benefit from tailored strategies that consider individual needs and variations. Continuous assessment and adaptation foster well-rounded growth and potential in gifted students.
Keywords: Talent, giftedness, high skills, high capacities, high abilities, teaching

Introduction

Addressing the issue from the perspective of physical education and sports

The traditional conceptualization of students with high abilities in the educational context has been and remains rooted in a predominantly cognitive perspective, which primarily values intellectual performance and academic excellence (Tannenbaum, 2003). In fact, the majority of regional and national regulations include them as students with special educational needs, alongside students with specific learning difficulties, students with late integration, etc. These regulations provide a common educational response for their social inclusion and development, such as the educational stage's flexibility, on an exceptional basis, without delving further into their definition. So, what role do practical subjects like Physical Education and Sports play in this process? What role does the Physical Education teacher play in their identification and development?

Throughout history, various terms have been employed to describe individuals with exceptional abilities: gifted, geniuses, talents, prodigies, among others. This diversity of concepts again reflects the complexity of the topic at hand. Often, these terms are used interchangeably, as if they were synonymous, to refer to individuals exhibiting outstanding performance. However, each of these terms carries nuances that set it apart from the others, imparting a distinct character. Numerous authors have delved into studying this distinction, with a focus on the concept of talent (Ferriz-Valero, Sellés et al., 2020), which some associate with having a "gift", something special, unique and exclusive. Talent is a scarce and valuable resource for society, and a considerable amount of human talent is squandered in each generation (Tranckle and Cushion, 2006). This misallocation of talents stems from a significant lack of understanding about the nature of talent (Csikszentmihalyi et al., 1993), which, concurrently, arises from the immense complexity of its conceptualization.

Exploring the nuances of talent or Giftedness: perspectives and definitions in the educational field

In the article titled "*On the nature of giftedness and talent: Imposing order on chaos*" the lack of consensus regarding the terminology used in the subject is highlighted. Nevertheless, both the author of the

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article (Morelock, 1996), and more recent ones (Jung, 2022) focus on distinguishing between two terms: giftedness and talent (Gagné, 1985). Morelock (1996) refers to the definition of giftedness as:

> "Giftedness is asynchronous development in which advanced cognitive abilities and heightened intensity combine to create inner experiences and awareness that are qualitatively different from the norm. This asynchrony increases with higher intellectual capacity. The uniqueness of the gifted renders them particularly vulnerable and requires modifications in parenting, teaching and counseling in order for them to develop optimally." (Morelock, 1996; p. 8).

This definition does not escape the attention of Professor Gagné, who offers a critical perspective (Gagné, 1997). Gagné presents several arguments. Firstly, he contests that development is not an inherent component of giftedness. Secondly, Gagné points out that the term "*asynchronous*" is used in Morelock's definition. Asynchronous implies comparison between things, which can vary from comparisons between different species to within the same species, among individuals or even within an individual. Such comparisons could encompass various traits like height, maturity, sexual maturity, motor skills, etc. Thirdly, Gagné notes a semantic flaw in the definition, as "giftedness" ends with the suffix -ness, which implies a condition or state, and thus cannot designate a process, asynchronous or not. Fourthly, precocity is a consequence of giftedness, not the other way around. The immediate outcome of the giftedness concept is the naturally high capacity for ease of learning, the most evident manifestation of giftedness. Fifthly, the definition is ambiguous and exclusionary. Gagné particularly highlights the segment of the definition that reads "*in which advanced cognitive abilities and heightened intensity combine to create inner experiences and awareness*".

The referenced concepts -heightened intensity, inner experiences, awareness- remain unclear. Lastly, but no less significant, Gagné asserts that there is a limitation in the concept of giftedness. If the focus of the definition centres on the term "precocity" the concept becomes restricted to children and adolescents, omitting adults. Considering that the giftedness concept involves natural high abilities that do not vanish with adulthood, it is unacceptable for the definition to exclude the majority of the population. Furthermore, the definition confines itself to cognitive abilities, even though the giftedness concept can also be reflected in sports, translating into high physical capabilities.

Building upon this definition of giftedness, Morelock defines talent as: "Talent is needed to refer to multi-leveled potential for domain-specific creative productivity in the world which can be fostered through appropriate identification and environmental support" (Morelock, 1996; p.10). Gagné (1997) presents the following arguments regarding Morelock's definition of talent. Firstly, talent is not a multi-leveled potential. Treating talent as a multi-leveled potential not only fails to differentiate it from giftedness but also disrupts the standardized definition of talent when speaking about talent for everyone. Secondly, talent as domain-specific creative production is limiting. Consequently, the inclusivity of the talent concept is unjustifiably reduced by making creative production a necessary component of talent.

Purpose

The aim of this narrative review is analyzing the different models of identification of talent to contribute to the optimal development of gifted students.

Material & methods

This narrative review amalgamates theoretical analysis with reflective insights, delving profoundly into the authors' perspective on how to understand the role of physical education in social inclusion of gifted students. Moreover, an engaged dialogue with expert literature has been undertaken, a process instrumental in unearthing and reimagining the subject matter with creative innovation. The foundation of the reflective framework is firmly rooted in PE and its potential contributions towards the attainment of gifted students. The authors of this study have maintained an ongoing cycle of dialogue, aiming to foster a comprehensive comprehension through a dynamic lens, correlating their viewpoints fluidly (Ribeiro dos Santos et al., 2018).

Within this study, a holistic educational approach that harnesses the subject of physical education within education systems for gifted students is proposed, with particular emphasis on the development of problem-based activities. In this light, physical education is put forth not solely for the cultivation of motor skills but also as a potent avenue to nurture intricate cognitive abilities such as reflection, evaluative reasoning, concentration, memory, decision-making, vigilance, and quick thinking (Bayu et al., 2022) in the pursuit of fostering awareness. To achieve this, one of the strategies proffered involves addressing students' contextual challenges within the realm of physical education, crafting learning scenarios that stimulate research and active participation. This endeavor is essentially an attempt to redefine physical education, transcending conventional perceptions that relegate it to a mere recreational or predominantly competitive pursuit. The exploration of prior research pivots around crucial theoretical constructs (Reese, 2022).

To encapsulate the multifaceted perspectives that have emerged from these debates, the discussions within this research are aptly organized into two dimensions:

a) Examine models for the identification and development of gifted students.

b) Assess the contributions of each model for the optimal development of gifted students.

Results

Below, 10 theories concerning gifted/talented students identification and/or development are presented. The first four theories are general, and the remainder are applied to sports-related development. The most significant aspects have been highlighted to condense the manuscript, always from the authors' viewpoint, to address the objective of this study.

1. *Tannenbaum's Star of Giftedness (Tannenbaum, 2003)*

This model particularly distinguishes between ability and academic performance and identifies the role of an individual's personality and their surrounding environment. It acknowledges that developed talent only emerges in adults. Children and adolescents who have the potential for adult giftedness are believed to require both general and specific abilities (moral, physical, emotional, etc.), as well as personality attributes that facilitate special interactions with environmental factors to foster the emergence of talent. The author considers five internal and external variables that contribute to excellence and form his renowned star. These are: general capacity, special aptitude, behavioral factors (related to personality), environmental factors and chance. Therefore, it is evident that there are static elements describing the individual at a given time, and dynamic elements that change, such as reading level or health status, for instance. In the latest version of this model, two types of talented individuals are differentiated: producers, who create something, an object, or an idea; and performers, who interpret and recreate that object or idea. Both categories of individuals can exhibit their creativity through producing something new or through their skilled competence.

2. *Renzulli's Three-Ring Model (Renzulli, 1978, 1986)*

Renzulli stated that great aptitudes of giftedness are multidimensional and can be found in various areas of human activity. However, it emphasized the role of creativity and introduced a third factor known as task commitment, encompassing traits such as perseverance, resilience, hard work, dedicated practice, self-confidence, etc. In his definition of giftedness, the author uses the term "above average" to refer to a group comprising 15-20%. Nevertheless, he contends that none of the three factors alone is sufficient to label a child as gifted or talented (Renzulli, 1978); there needs to be an interaction among all three factors (above-average ability, commitment, and creativity).

3. *Ericsson's Deliberate Practice (Ericsson, 1993, 2010)*

K. Anders Ericsson, a prominent researcher of deliberate practice, highlights its role in achieving expertise and success. Deliberate practice refers to focused activity aimed at improving specific performance aspects. One challenge of this theory lies in distinguishing between "expert", "expertise" and "experience". When an individual begins an activity (e.g., sports), they need experience to acquire related knowledge, understand its structure (e.g., new sport), and learn its rules. Sufficient experience and concentration during this *Cognitive phase* enable the individual to produce correct actions, increasing speed and control, especially for frequent patterns and familiar situations. After crossing this threshold, the individual enters a second phase called *Associative*. Here, the person can learn and execute more complex sequences of actions. After training and experience - around 50 hours in some activities - performance becomes automated, entering the third phase, Automation. Once execution reaches this level of automation and efficiency, additional experience by itself doesn't enhance performance levels, as demonstrated in interdisciplinary studies. Without deliberate practice, individuals remain stagnant at the lower levels (for everyday activities) or at the central part of the model. Only deliberate practice can prevent this stagnation and lead to expertise. Ericsson identifies complex mechanisms and physiological adaptations that differentiate expert individuals from non-experts. He establishes a relationship between competence or performance level and time. Maximum performance in a domain is generally reached around the age of 30, about a decade after final physical maturation. Ericsson underscores the significance of at least 10 years or 10,000 hours of deliberate practice to achieve an international performance level, even for those considered gifted.

4. *Integral Model of Talent Development (Gagné, 1995, 1998, 2000, 2004, 2009, 2015)*

This theory, currently referred to as the Integral Model of Talent Development (IMTD), is proposed by Professor Françoys Gagné. This model is the culmination of an evolutionary process involving the Differentiated Model of Giftedness and Talent (DMGT) (Gagné, 1985) and its integration with the Model of Natural Abilities Development (DMNA) (Gagné, 2015). Originally proposed over 30 years ago, the DMGT has evolved over time and expanded its applications, now encompassing fields beyond general education, including sports (Tranckle & Cushion, 2006). In the DMGT, "*giftedness*" refers to the possession and use of untrained natural and spontaneous abilities, known as "great aptitudes" or "gifts" in at least one domain, to a degree that positions an individual within the top 10% percentile relative to peers of the same age. Similarly, "*talent*" denotes a superior mastery of systematically developed skills or capacities in at least one field of human activity, placing an individual within the top 10% percentile among peers active in that field. Giftedness and talent share three common characteristics: both involve human capacities, are normative (deviating from average), and represent outstanding behaviors. However, while the term "aptitude" is used to refer to potential, its evaluation equates to assessing some form of performance. Gagné emphasizes the overlap between aptitude and performance evaluation. The DMGT identifies distinct domains for natural aptitudes or gifts, including mental (intellectual, creative, social, perceptual) and physical (muscular) domains. These natural capacities develop during

maturation and informal and unsystematic learning. Genetic factors influence the expression and development of these capacities. Natural capacities are more noticeable in young children due to limited influences of environment and systematic learning. Gagné's talent development process asserts that natural capacities serve as the raw material for talent. Component D defines a systematic pursuit by talent apprentices over a significant period of time of a structured program of activities leading to a specific goal of excellence (Gagné, 2015). This component comprises three subcomponents: (1) activities, (2) investment, and (3) progress. The talent development process involves structured talent-oriented programs accessed through selection. These programs include specific content offered within specific learning contexts. Investment quantifies the intensity of talent development in terms of time, money, and psychological energy. Progress tracks apprentices' advancement from novice to expert through stages like beginner, advanced, competent, and expert. Catalysts, both intrapersonal and environmental, influence development. Within DMNA, natural capacities are not innate; they develop during childhood and sometimes into adulthood. Describing a talent as innate is metaphorical; even statements like "Mario was born a football player" metaphorically indicate Mario's rapid progress due to his high natural capacity. Gagné introduces two new components: maturation and informal learning. Maturation involves various biological processes influencing the growth of mental and physical capacities. Informal learning lacks structured organization, taking the form of spontaneous, unconscious acquisition. This model mirrors the DMGT's talent development process subcomponents (DA, DI, and DP), although the lack of structure hampers systematic evaluation. Both intrapersonal and environmental catalysts are crucial in development. Intrapersonal catalysts include physical and psychological traits (IP) and goal management. Environmental catalysts manifest in near environments (EM), personal influences (EI), and services (EP). Casual factors exert influence over development, driven by genetic transmission. In IMDT, the origins of talent lie in the gradual accumulation of natural capacities, from the union of sperm and cells. The biological levels (genotype, endophenotype, and exophenotype) shape natural capacities, influenced by intrapersonal and environmental catalysts and informal learning. Eventually, individuals select a talent field guided by self-awareness and motivation, initiating the complex path to superior performance. The IMDT emerges from the fusion of DMGT and DMNA.

5. Bloom's Talent Development Model (Bloom, 1985)

According to Benjamin S. Bloom, following a qualitative study involving talented individuals across various fields (swimmers, tennis players, mathematicians, musicians, etc.), talent development can be categorized into three stages with common features: Initiation, Development, and Mastery. Stage 1 (Initiation): In this early phase, young athletes experience a sense of romance with their chosen specialty. They explore and test the waters of the activity, learning basic motor skills in a playful manner. Their motivation is external, driven by immediate rewards such as praise. What sets talented children apart is their willingness to work hard and put in effort. Parents play a significant role, exposing their children to areas of talent they consider positive. Sometimes, parents themselves have a connection to the field. They set goals for their children, and often invest substantial time in the activity, providing guidance along the way. This stage can encompass the initial years of introduction through to secondary education (ages 12-18), depending on the sport, family, and athlete. Coaches in this stage are known for being understanding, affectionate, and fun, rather than highly specialized. Stage 2 (Development): In the middle stage, young athletes focus on learning all aspects related to their sport, including technique and tactics. They take more responsibility for their own learning and development. Motivation begins to shift from external to intrinsic, as they work not only for praise but also for personal well-being. Athletes start identifying with the sport and gain recognition for achieving goals not attainable by everyone. This stage can start as early as 8 years old or as late as 12-16 years old. While learning can start in the second stage, engaging in a specific sport without prior enjoyment can lead to motivation loss. Parents often recognize the need to transition from the first playful stage to the second training stage. They seek coaches who can meet their children's advanced needs. Parental support becomes less about practice assistance and more about time and financial commitment. Sometimes, this commitment is so great that other children in the family receive less attention. Family plans, including vacations, may revolve around the sport, involving tournaments or camps. Coaches in this stage become stricter and more demanding, setting high standards for precision and effort. They make the sport engaging, exciting, and challenging. Stage 3 (Mastery): In this later stage, athletes work diligently to achieve mastery or excellence in their sport. They transition from applying skills specifically to analyzing the sport as a whole. Limited effort in the previous stage may hinder athletes' holistic understanding of the sport in order to maximize performance. Motivation is entirely intrinsic, as many young athletes invest countless hours, receive critiques from experts, and compete with equally or more skilled peers, often without monetary compensation. They don't view it as work, but rather as a calling and a professional career. This stage typically begins after completing secondary education (ages 16-20) or at the start of university studies. Parents continue to contribute financially to their education. Coaches in this stage are the best in the sport, highly committed to the field. Despite the demanding expectations, athletes take pride in being chosen.

6. Côté's Sports Participation Development (Côté 1999)

This model was initially formulated by Côté in 1999 and further developed by Côté and Hay (2002). Similar to the Bloom model, it stems from qualitative interviews with athletes across various sports. The model proposes three potential pathways: (1) recreational participation through experience, (2) elite performance through

experience, and (3) elite performance through early specialization. The first two share a common foundation, catering to athletes aged 6 to 12. After this age, athletes can opt to continue in the sport recreationally (beyond 13 years) or focus on performance. Both trajectories share physical and mental health benefits. In contrast, the final trajectory, while yielding superior performance, may lack these health benefits (e.g., injuries) and enjoyment. The model distinctly differentiates between deliberate play, seen as sport development primarily for enjoyment through play with adapted rules and materials, and deliberate practice, viewed as sport development through activities aimed at enhancing performance. Pathway 1 (Recreational Participation): From ages 6 to 12, athletes engage in a variety of sports, emphasizing the development of deliberate play activities. These years are deemed foundational in development. Activities can encompass both deliberate play and deliberate practice, allowing sports programs to flexibly adapt to athletes' interests and ages. Coaches are nurturing and supportive during this stage, and parents provide the resources required by athletes (e.g., equipment, transportation). Pathway 2 (Elite Performance): From ages 6 to 12, athletes can choose a performance-oriented pathway. However, specialization begins around age 13 within this trajectory. Specialization years (ages 13-15) are considered a transition to future investment years (beyond 16 years). During the specialization stage, young athletes engage in fewer activities, mostly a mix of deliberate play and deliberate practice. Later, during the investment stage, the focus shifts towards deliberate practice activities. Both during specialization and investment stages, there's a stronger athlete-coach bond, with coaches emphasizing technical sport skills. Parents continue to offer substantial financial and emotional support. Pathway 3 (Early Specialization for Elite Performance): In sports where peak performance is achieved before puberty, early specialization is necessary to attain elite performance. Athletes following this pathway often skip trial years, potentially missing out on positive psychosocial development. Moreover, early specialization often leads to injuries. This pathway involves a significant amount of deliberate practice time and, conversely, limited play. In other trajectories, athletes from any of the aforementioned paths can cross over between them. In certain sports, investing in a sport might not be possible without first undergoing a specialization stage. Ultimately, at some point within the sports participation development, an athlete might choose to discontinue practice altogether. This represents the program's greatest failure, as it fails to produce physically active and healthy individuals, a concern evident in the sedentary population (Côté and Fraser-Thomas, 2007).

7. Balyi's Long-Term Athlete Development (Balyi et al., 2004, 2013)

Balyi and Hamilton (2004) elaborate on the model of long-term athlete development: trainability in childhood and adolescence. The authors address the advantages of opportunity and optimal training within this model, arguing for the significance of long-term development over short-term gains, which tend to be prioritized by most families and sports coaches. There are no shortcuts in athletic development. Emphasizing competition during the early stages of training will likely lead to future shortcomings in an individual's athletic career. The authors propose two developmental models related to sport specialization, which can be classified as: (1) early specialization in sports such as skating, gymnastics, table tennis, etc., and (2) late specialization in sports like judo, cycling, tennis, rowing, etc. While this model accounts for both early and late specialization sports, the authors focus on the latter. However, each sport should devise its unique model. In summary, in Phase 1 (FUNdamental), gender differentiation is introduced during this phase (6-9 years for boys and 6-8 years for girls). The goal is to acquire all fundamental motor skills. Notably, the learning of these skills must be inherently enjoyable. These basic motor skills include locomotion (walking, running, swimming, etc.), manipulation (both eye-hand and eye-foot coordination, as well as fine and gross motor coordination), and balance. This phase is further subdivided into three sub-phases: (1) Initial (2-3 years), (2) Elementary (4-5 years), and (3) Maturity (6-7 years). The first critical period for speed development occurs in this phase, at ages 6-8 for girls and 7-9 for boys. Thus, it's recommended to work on linear and lateral speed, along with direction changes, not exceeding 5 seconds. This is sometimes referred to as the "agility, speed, and change of direction window". Strength should be developed similarly to the previous phase, incorporating exercises using the individual's body weight, medicine balls, and stability balls. Introduction to basic sport rules and ethical values is necessary. While there's no room for periodization, all activities must be planned, structured, and supervised. Participation in a wide range of sports is encouraged, as advocated by other authors. If a child and their family lean towards a specific sport, it's suggested to engage in one or two sessions per week in that sport and three or four sessions in different sports, as an essential measure for achieving athletic excellence. This will help the child engage in recreational physical activities if they eventually step back from competitive sports. In Phase 2 (Learning to Train), children aged 9-12 (boys) and 8-11 (girls) are the focus. The objective is to learn all fundamental sports skills. Often referred to as the critical period of motor coordination development, this phase is considered one of the most important for the athlete's overall motor development, as the individual is now biologically prepared to acquire general sports skills, which are the cornerstone of athletic development. Thus, both fundamental motor skills and general sports skills continue to be developed. Failing to develop fundamental motor skills during this phase results in a missed opportunity to reach the individual's maximum potential. Strength development should follow a similar approach to the previous phase. Multijump routines and exercises can also be introduced. Endurance is developed through games, relay games, etc. Flexibility should be introduced with basic exercises. Speed can be developed through specific activities during warm-ups, such as agility, speed, and direction changes.

Competition must be well-structured in this phase. A recommended ratio of 70:30 for training and competition preparation, respectively, is advised. Phase 3 (Training to Train) is intended for ages 12-16 (boys) and 11-15 (girls). The goal is to build an aerobic and strength base, analogous to creating the engine by the end of this phase, and to develop (or solidify) specific sport skills. During this phase, athletes solidify sport-specific skills and tactics. This phase is critical for aerobic capacity and strength development. Optimal aerobic endurance training begins with the onset of the Peak Height Velocity (PHV). Aerobic training should be prioritized early in PHV, while specific skills, speed, and strength should be maintained or developed later. Flexibility work is crucial due to the rapid growth of bones, tendons, ligaments, and muscles. There are two critical periods for strength development in girls. The first occurs immediately after PHV, and the second begins with the onset of menarche. For boys, the critical period for strength training starts 12-18 months after PHV. The trainability of both aerobic endurance and strength depends on the maturation level, necessitating consideration of different maturation timings (early, normal, and late) according to Sherar et al., (2005) to apply desirable stimuli, not just chronological age as is commonly done. While competition athletes play to win and excel, this phase pays special attention to understanding fundamental game concepts and training, rather than focusing solely on competitive results. Therefore, overloading with too many competitions replaces valuable training time as the primary goal of this phase. This doesn't imply competition should be eliminated, as it helps to practice technical and tactical sport skills and teaches coping with physical and mental challenges. While the ratio will depend on sport and athlete specifics, experts generally recommend a 60:40 ratio for training and competition, respectively (including specific competition training). Athletes undergoing this type of preparation will be better equipped for both short-term and long-term competition compared to those solely focused on winning. Both Phase 2 and Phase 3 represent the most crucial stages of athletic development, as they shape the athlete or limit their growth. In Phase 4 (Training to Compete), boys aged 16-18 and girls aged 15-17 are included. The primary goal is to optimize physical and technical/tactical performance in the respective sport. This phase's development follows the achievement of the prior phase's goals. Hence, the competition ratio shifts to 50% training (physical conditioning and development of both technical and tactical skills) and 50% competition (including specific competition training). During this phase, athletes experience high-intensity training throughout the year. Athletes who are already proficient in basic and sport-specific skills learn to apply them under a variety of competitive conditions during training. In this phase, training programming – including physical, recovery, psychological, technical, and tactical aspects – is tailored to the athlete to a greater degree, addressing individual strengths and weaknesses. Phase 5 (Training to Win) encompasses ages 18 and above for boys and 17 and above for girls. The primary aim of this phase is to maximize physical preparation, specific skills, and sport performance. This represents the final phase of athletic preparation. The athlete's physical, technical, tactical, mental, and personal capabilities are individual and well-established, prompting a shift in focus towards maximizing them to achieve peak individual performance. Training intensity and volume are significantly increased. Frequent breaks help prevent physical and/or mental burnout. The training to competition ratio is 25:75, respectively. Finally, Phase 6 (Retirement or Retention) does not have set ages. The objective of this phase is to retain athletes as coaches, judges, club administrators, etc.; after they retire from competition or high-level competition.

8. *Acquisition and Retention of Expert Performance (Starkes et al., 2004)*

This model explains the transition between perceptual-cognitive behaviors and perceptual-motor behaviors as the acquisition of motor skills on one hand, and on the other, how these motor skills can be retained after reaching a peak performance. The unique feature of this model lies in its considerations for skill acquisition and retention after that peak performance. Performance is regarded as a constant transition through phases that exhibit distinct and diverse behaviors. The model differentiates two major streams: (A) perceptual-cognitive (what the athlete can see and understand) and (B) perceptual-motor (what the athlete can perceive and execute). Performance emerges as a product of these streams, and its facilitation or hindrance depends on their interaction. As previously mentioned, the model presents two streams. While these streams can evolve at different rates, they are closely interrelated as the athlete's performance depends on both. In Phase 1 (Development of conceptual and procedural skills), the athlete accumulates a substantial amount of sport-specific conceptual learning. Concurrently, the athlete acquires a broad repertoire of motor skills. This enables the learning athlete to experiment with movements that are most efficient in certain sport-specific situations. This process results in the creation of a resource bank ("if... then...") that establishes an interconnected relationship between the two streams (knowledge and execution). Phase 2 (Content condensation and elaboration) is based on a study involving dancers (Jack et al., 2003; in Starkes, et al., 1996). Skilled athletes with more experience adopt strategies that reduce cognitive load associated with short-term memory while utilizing long-term memory to reproduce dance sequences. As short-term memory is economized, greater detail in reproducing the given motor skill is retained, resulting in higher execution quality. This phase signifies both the condensation and elaboration of the athlete's skill. In Phase 3 (Specialized routine), the athlete is considered an expert for the first time. The athlete possesses a set of scripts (automated motor patterns), utilizing their sport experience and knowledge to assign an expected sequence of actions for a specific outcome. This "knowledge" does not necessarily refer to the athlete's ability to verbally explain movement techniques or game strategies. Rather, it indicates that the skill is automated. Furthermore, the authors suggest that this high skill level depends on how efficiently the athlete

can intentionally alter a skill to adapt it to a given context (rescript). This phase aligns with the third phase proposed by Fitts and Posner (1967) called the "automatic" phase (complex movements carried out unconsciously) in their motor skill acquisition theory. Probability is also highly emphasized in this phase. In sports, athletes read the game and, based on this reading, calculate the probabilities of various responses. Expert athletes can make informed decisions based on these calculated probabilities. Phase 4 (Special ability) includes athletes who have achieved exceptional performance and are considered geniuses. They are characterized by the efficient optimization of effort for a specific skill and innovation. Innovation can range from being simple (being faster or having better technique) to complex (faster, stronger, more agile, etc.). In this phase, in addition to a broad conceptual knowledge in the perceptual-cognitive stream (phases 1, 2, and 3), athletes store a wealth of experience from various situations in their memory. But how can these motor skills be retained after reaching a peak performance? The authors acknowledge this advantage of the model. Throughout a professional athlete's career, the significance of each stream (cognitive vs. motor) changes. In fact, certain capacities involute, such as flexibility, and adaptations in the cognitive stream can mask losses in the motor stream. The authors illustrate this with the example of Michael Jordan, who retired and later returned to a high level of performance. This example emphasizes the importance of the perceptual-cognitive stream, as the authors consider that Michael Jordan had a brief period of physical conditioning before his return and did not possess the same physical level he had when he retired. The authors also recognize that the model does not prescribe maximum times to achieve peak performance. The characteristics of each phase are only indicative and do not dictate specific rhythms (in terms of ages or years). This justification is based on the uniqueness of each sport and the age at which an athlete starts or specializes. Therefore, the model is applicable to any sport.

9. Holistic approach to athletic talent development environments (Henriksen et al., 2010)

Commonly referred to as the ATDE (Athletic Talent Development Environment) model, Henriksen, Stambulova, and Roessler in 2010 state that the aim of this model is to provide support to young athletes transitioning from junior athletes to top-level absolute athletes. The athlete is positioned at the center of the model. However, other components of the model are structured into two levels, micro and macro, and two domains, athletic and non-athletic, complemented by the past, present, and future. The micro-level pertains to the environment where future elite athletes spend a significant portion of their time and thus directly interact with the athlete. Conversely, the macro-level refers to the environment that does not directly interact with the athlete but does influence their development (cultural values and customs). In terms of the athletic domain, it encompasses the environment directly related to the specific sport, while the non-athletic domain covers aspects of the athlete's life beyond sports. Directly surrounding the athlete is the environment provided by the club: coaches, managers, other athletes (in training or experts). The next layer closest to the athlete, at the micro-level, is divided into the two aforementioned domains. In the first half, the non-athletic domain includes school, family, friends, etc. In the other half, the athletic domain includes the sports club to which the athlete belongs. Similarly, the next layer includes the same factors as the previous layer but at the macro-level, encompassing policies related to the educational system (non-athletic domain) and regional and national federations (athletic domain). The outermost layer of the model represents the past, present, and future, emphasizing that the environment is dynamic and both athletes and their contexts are constantly changing and mutually influencing. This model considers an athlete's development as influenced by the context in which this development occurs, which is why the authors justify it as an ecological model. Additionally, the authors affirm the model's global and holistic nature in three aspects: it includes both non-athletic and athletic domains, micro and macro levels, and development across the past, present, and future of the environment.

10. FTEM Model (Gulbin et al., 2013)

This model, proposed by Gulbin, Croser, Morley, and Weissensteiner in 2013, is divided into 4 macro stages, as indicated by its acronym. The "F" stage stands for Fundamentals, where these elements are related to the basics of movement. Other authors refer to them as fundamental movement skills (Booth et al., 1999) and associate them with terms like motor literacy (Whitehead, 2001). The FTEM model acknowledges the fundamental role that a variety of motor experiences during childhood play in the holistic development of a child. Within this stage, there are three more stages (F1, F2, and F3). The sub-stage "F1" (learning and acquisition of basic movement fundamentals) highlights the importance of experiencing a wide and varied range of essential movements that lead to the acquisition of a broad repertoire of foundational motor patterns, both locomotor and manipulative in nature. This includes perception, experience, memory, anticipation, and decision-making. The sub-stage "F2" (extension and refinement of fundamental movements) is characterized by the refinement of basic movements learned or experienced in the previous phase. This advancement is due to both formal and informal play, and practice of specific and non-specific sports-related activities, especially those carried out in educational settings. The sub-stage "F3" (specific commitment to sport and competition) is characterized by an increased commitment to training, developing sport-specific skills, and engaging in competitive activities. It takes place within a sports club and can involve competition against others or oneself. The "T" stage (talent demonstration and success) is further subdivided into 4 more stages. In the sub-stage "T1" (demonstration of high performance potential), athletes demonstrate their potential for high-level sports performance through objective and quantitative measures in various domains: physical, physiological, psychological, etc. In the sub-stage "T2"

(talent verification), athletes showcase their potential through subjective and qualitative measures recognized by experts, such as experienced coaches. The sub-stage "T3" (practice and achievement) is characterized by athletes committing to high levels of sport-specific practice to enhance their individual performance. In the sub-stage "T4" (advancement and reward), athletes are rewarded with professional support, sports scholarships, or selection for advanced training programs, typically based on their achievements in the previous phase. In the "E" stage (Elite), differentiation is made based on the sport being practiced and whether it is an Olympic sport or not. It is further divided into two sub-stages. In "E1," for Olympic sports, athletes are considered to be in this stage if they represent their country internationally. For non-Olympic sports, athletes in this stage are those who compete at the highest levels of their respective sport. In "E2," for Olympic sports, athletes in this stage achieve podium placements in international competitions, while for non-Olympic sports, it includes athletes who excel at the highest levels of competition consistently over time. In the "M" stage (Mastery), for Olympic sports, athletes in this stage consistently achieve podium placements in international competitions. For non-Olympic sports, it recognizes athletes who sustain their success repeatedly over extended periods of time.

Discussion and summary evidence

Based on the definition by Csikszentmihalyi et al., (1993), Tranckle and Cushion (2006) suggest that the term talent only exists in a particular context, one that recognizes it. Talent is bound within a specific domain and is not comparable across different domains (e.g., music and sports). Hence, the complex nature of talent appears to stem, in part, from an essentially relative and specific quality. Talent can only be talent and acknowledged as such where it is valued (Tranckle and Cushion, 2006).

Considering the aim of the present study, the first two more general models have some limitations. Tannenbaum's model (originally designed for the intellectual domain) simply doesn't offer an applicable interpretation for talent or giftedness in physical education and sports, intensifying this limitation with the subsequent modifications applied to the model, such as classes of individuals or main areas of talent. Regarding Renzulli's Three-Ring Theory, confining talent to the domain of specific creative production is limited (Gagné, 1997). Talent cannot be necessarily tied exclusively to the creative field. For example, how much creativity does a swimmer need to possess to be considered talented in swimming? Or a runner? This model doesn't account for environmental factors that play pivotal roles in talent development, such as family, socioeconomic status, mentors, etc. So that, Renzulli's three-ring model was expanded by Van Boxtel and Mönks (1992), in order expanded to contextual components.

On the other hand, despite not being a sports-focused model, one comprehensive theory for understanding and identifying talented students is Gagné's Theory, adapted to sport (Tranckle and Cushion, 2006).

Within the specific theories in the sports domain, selecting the most comprehensive model largely depends on the objectives and context of its application. If we consider the breadth and depth of the concepts addressed, Balyi's Long-Term Athlete Development model tends to be the most comprehensive. It aligns with the idea of gradual skill improvement and when it applies. For physical education, this emphasizes structured training plans over time. Educators should plan lessons that introduce new skills gradually while ensuring consistent practice. On the other hand, the "Environmental Model of Sports Talent Development" by Henriksen tends to be very practical. This model shines through its ecological approach, accounting for multiple levels of influence from micro to macro, and from sports-related to non-sports-related domains. It acknowledges the interaction between the individual and their environment, as well as the ever-changing dynamics of these elements. Furthermore, it incorporates the past, present, and future aspects of the individual's environment.

Conclusions

While each theory presents its own unique and distinguishing approaches, several common points can be identified. Firstly, the theories adopt a holistic approach, recognizing that cognitive, physical, emotional, and social aspects are integral to the process of human talent development, with particular relevance to the subject of physical education due to its benefits across these dimensions (Bayu et al., 2022). Secondly, each theory acknowledges the interaction between the individual and their environment, emphasizing the importance of well-planned instruction, especially in physical education and sports, for catering to gifted students and creating new chances. In fact, several theories, such as Bloom's model, the FTEM model, and the Balyi model, underscore the significance of gradual progression in sports talent development.

This entails a well-structured step-by-step approach to acquiring and improving skills over time. Thirdly, the importance of commitment and deliberate practice, highlighted in Ericsson's theory, is emphasized. Ericsson's Theory can always be complemented with all of them since all theories recognize the significance of dedication, commitment, and focused practice to enhance performance and talent development. Fourthly, various models, such as the Gagné and Balyi model, emphasize the importance of recognizing individual differences in the talent development process. This involves adapting approaches and opportunities based on the unique capacities and needs of each individual. Furthermore, each theory considers the importance of adjusting the approach according to the context. Lastly, all theories underscore the idea that talent is not static but evolves

over time. This reinforces the notion that talent is not innate and highlights the significance of a long-term approach and continuous commitment to personal improvement and development.

Certainly, the choice of the most suitable model will depend on specific objectives and the characteristics of the group of gifted students being addressed (Ferriz-Valero, 2018). In many cases, a combination of approaches from various models could offer a more comprehensive and holistic view of talent development within the educational context. This approach recognizes that talent is multifaceted (not just cognitive) and influenced by a range of factors, including anthropometric profile (Ferriz-Valero, Martínez-Sanz et al., 2020), individual abilities (Ferriz-Valero, García et al., 2020), environmental conditions, and the nature of the activity itself. Educators can benefit from integrating elements from different theories to tailor their teaching strategies to the unique needs of their students. By understanding the strengths and limitations of each model, educators can create a more flexible and adaptable approach that nurtures talent while considering individual variations. This approach not only encourages the development of specific skills but also fosters the growth of well-rounded individuals who can excel in various domains. Furthermore, considering the dynamic nature of talent development and the diverse backgrounds of students, educators should continuously assess and adjust their approaches. Finally, the goal is to provide a supportive and enriching environment that allows gifted students to reach their full potential.

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