Z Erziehungswiss (2022) 25:1199–1220
https://doi.org/10.1007/s11618-022-01110-2

ZfE

SCHWERPUNKT

Talent as a social construction: Proposing a constructivist conceptualization of athletic talent

Jannika M. John · Ansgar Thiel

Received: 14 July 2021 / Revised: 4 April 2022 / Accepted: 20 May 2022 / Published online: 5 July 2022

Abstract Talent identification, selection, and development represent critical areas of inquiry for sport scientists as indicated in the large amount of research attention dedicated to these topics. However, talent researchers rarely explicitly discuss their underlying conceptual understanding of "talent".

Within this article, we approach the construct "talent" from the perspective of social constructivism. We consider talent as a social construction that is historically changing and contextually embedded. Organizations that act as "purchasers" of talent (sports clubs, youth squads, etc.) have to develop ideas about which athletes represent the best fit against the background of the performance conditions within the respective sport (in the sense of possessing the set of characteristics that is most promising for future success). The purpose of these organizational "talent" descriptions is to try to ensure that the person with the highest chance of being successful is promoted. However, multidimensionality, asynchronicity, and discontinuity of talent development make the prediction of sporting success extremely difficult. Talent development needs to be thought of as an iterative process that is highly individualized and idiosyncratic. To make a person fit to the expectations of an organization requires a high degree of flexibility, reflexivity, and, not least, patience from talent development programs.

Using the example of athletic talent, we show that the principles of constructivism provide a useful terminological, theoretical, and methodological basis for the empirical analysis of the complex process of talent emergence and development.

Dr. Jannika M. John (✉) · Prof. Dr. Ansgar Thiel
Institute of Sports Science, Social and Public Health Sciences and Interfaculty Research Institute for Sport and Physical Activity, Eberhard Karls University Tübingen, Wilhelmstraße 124, 72074 Tübingen, Germany
E-Mail: jannika.john@uni-tuebingen.de

Prof. Dr. Ansgar Thiel
E-Mail: ansgar.thiel@uni-tuebingen.de

Methodologically, idiographic approaches are needed that explore the intrinsic dynamics of talent development pathways.

Keywords Critical review · Sport · Constructivism · Talent · Talent development · Organization

Talent als soziale Konstruktion: Ein Beitrag zu einer konstruktivistischen Konzeptualisierung sportlichen Talents

Zusammenfassung Die Identifizierung, Auswahl und Entwicklung von Talenten ist für Sportwissenschaftler ein wichtiger Untersuchungsgegenstand, wie die große Zahl von Forschungsarbeiten zeigt, die sich mit diesen Themen befassen. Allerdings erörtern Talentforscher nur selten explizit ihr zugrundeliegendes konzeptionelles Verständnis von „Talent".

Wir schlagen im Folgenden ein konstruktivistisches Verständnis von Talent vor. In diesem Zusammenhang betrachten wir Talent als eine soziale Konstruktion, die sich historisch verändert und kontextuell eingebettet ist. Organisationen, die als „Abnehmer" von Talent auftreten (Sportvereine, Nachwuchskader etc.), müssen eine Idee davon entwickeln, welche Athleten vor dem Hintergrund der Leistungsbedingungen in der jeweiligen Sportart am besten passen (im Sinne davon, dass sie das Muster an Eigenschaften besitzen, das am ehesten späteren Erfolg verspricht). Der Zweck derartiger Talentbeschreibungen ist es sicherzustellen, dass die Person mit den höchsten zukünftigen Erfolgschancen gefördert wird. Die Mehrdimensionalität, Ungleichzeitigkeit und Diskontinuität der Talententwicklung machen die Vorhersage von sportlichem Erfolg jedoch extrem schwierig. Talententwicklung muss daher als ein iterativer Prozess verstanden werden, der hochgradig individualisiert und idiosynkratisch ist. Die Anpassung einer Person an die Erwartungen einer Organisation erfordert von Talententwicklungsprogrammen demnach ein hohes Maß an Flexibilität, Reflexivität und nicht zuletzt Geduld.

Am Beispiel des sportlichen Talents zeigen wir, dass die Prinzipien des Konstruktivismus eine nützliche terminologische, theoretische und methodische Grundlage für die empirische Analyse des komplexen Prozesses der Talententstehung und -entwicklung bieten. Methodologisch sind idiographische Ansätze notwendig, die die Eigendynamik von Talententwicklungsverläufen erforschen.

Schlüsselwörter Kritischer Review · Sport · Konstruktivismus · Talent · Talententwicklung · Organisation

1 Introduction

The excellent performances of athletes, musicians, scientists, artists, and the like have attracted the attention of researchers for over 150 years. Beginning with the study of Galton (1869) on the family trees of eminent British men, talent research has become an important field of research in various academic disciplines, particularly within sports science and education sciences. Historically, talent research has been

heavily influenced by the nature-vs.-nurture controversy (Galton 1875), which still implicitly influences current views on the development of high-achievement in talent research (Den Hartigh et al. 2016) in that one line of research primarily focuses on the role of innate abilities (nature) for attaining extraordinary performances whereas another line of research focuses predominantly on the role of contextual factors (nurture) such as practice conditions, coaching, or family and peer support. While most contemporary talent researchers actually acknowledge the importance of nature and nurture for the attainment of high-achievement, according to Vaeyens et al. (2008), the ongoing debate about the relative contribution of nature and nurture and terminological inconsistencies might have impeded the development of knowledge in the field.

For sports scientists, talent identification, talent selection, and talent development represent critical areas of inquiry as indicated in the large amount of research attention dedicated to these topics (Baker et al. 2020). Current research, however, suggests that our ability to identify, select, and develop "talent" is still imperfect (Baker et al. 2020), at least if we assume that the main objective of talent programs is to find and develop those athletes with the highest potential for future success. In this context, recent analyses within German youth soccer, for instance, suggest high turnover rates within youth elite academies and national youth teams (e.g., Güllich 2014; Schroepf and Lames 2017), which hint at a poor efficiency of the talent programs in terms of identifying, selecting, and nurturing promising players. In a similar vein, a recent meta-analysis by Güllich et al. (2021) observed that early involvement in talent development programs correlated negatively with senior world-class performance.

These observations lead to two conclusions: either "early" talent is overrated, as proponents of the nurture position and deliberate practice would likely argue (Colvin 2010; Ericsson et al. 1993), or the commonly held conceptualization and operationalization of talent remains vague (cf. Abbott and Collins 2002). In this article, we follow the later line of thought. As Tranckle and Cushion (2006) observe, talent researchers have paid relatively little attention to the concept of talent from a broad conceptual standpoint, and rarely explicitly discuss their underlying conceptual understanding of "talent". This represents a serious drawback for talent research and practice since the understanding of "talent" influences research designs, identification practices, and strategies for talent development (Baker et al. 2017). In recent years, some conceptual papers, mainly from a psychological perspective, have been published (e.g., Baker et al. 2019); however, conceptual work from a sociological perspective that considers the talent "problem" not only in terms of the person to be promoted but also from an organizational point of view is lacking.

1.1 Objectives

Since there is considerable variation in terms of the conceptualization and definition of talent in sports science (Johnston et al. 2018), the central intention of our article is to make a theoretical contribution to a more differentiated understanding of the concept of talent. In this regard, we aim to propose a conceptualization of athletic talent from a constructivist perspective that explicitly considers the role of sports

organizations not only as determinants of talent development but also as essential "constructors" of what is meant by talent.

In this context, we want to stress that we consider a constructivist perspective as one possible theoretical perspective in which talent is understood as a social construction. We acknowledge that similar considerations in research on the development of "extraordinary selves" are not completely new; already Gruber (1998), for example, described talent and giftedness as social constructions. However, the paper does neither analyze talent in sport, nor are the implications for practice and for talent research of such an understanding described in detail. Further, the conceptualization proposed in this paper should not be understood in the sense of a "model" that can be directly translated into empirical research. It rather represents a conceptual framework of talent and its development and should be read as an invitation to a reflexive engagement with previous blind spots in talent research, which still very much follows a post-positivist natural science paradigm (cf. Baker et al. 2020).

In this regard, in a first step, we present and critically discuss current sports scientific definitions and conceptualizations of talent and its development. In a second step, we delineate a constructivist understanding of talent and its development and discuss three inferences that can be drawn from our theoretical deliberations. Thirdly, we discuss the consequences of a constructivist perspective on athletic talent development for the methodological foundation of future talent-related research and practical interventions.

2 State of research

2.1 Talent definitions within sports science

As mentioned above, there is no common understanding of the term talent in sports science, even if research practice pretends that it is unambiguous what is meant by the term talent (Johnston et al. 2018). For instance, in German-speaking countries, the term talent is used to refer to young performers who are still in the process of development. Thus, talent in this context denotes a potential for future top performance. In contrast, in Anglo-American contexts, the term talent is also applied to current top performers (Güllich 2013).

Within a review on talent definitions within the field of work, Gallardo-Gallardo et al. (2013) identified subject- (talent as an individual) or object-related (talent as ability) approaches to talent, predominantly innate (nature) or acquired (nurture) conceptualizations of talent, or approaches that focus more on the input (such as abilities and motivation) or output of talent (such as excellent performance and success). Inconsistent definitions and operationalizations of talent can also be found within sports scientific talent research as Baker et al. (2020) note in their extensive scoping review on talent research. Within Table 1, we applied the proposed differentiation of Gallardo-Gallardo et al. (2013) to exemplary talent definitions from the sports scientific literature. It is important to note that definitions often exist on a continuum and this categorization is not to be seen as a clear dichotomy, but rather as one possible way to differentiate various conceptualizations of talent.

Table 1 Conceptualizations of athletic talent

Talent	
... as an individual (e.g., Gabler and Ruoff 1979; Williams and Reilly 2000)	... as ability (e.g., Gray and Plucker 2010)
... as innate (e.g., Baker et al. 2019; Brown 2002)	... as acquired (e.g., Gagné 1995)
... related to input (such as abilities and motivation) (e.g., Csikszentmihalyi et al. 1993)	... related to output (excellent performance and success) (e.g., Abbott and Collins 2004; Faber et al. 2016)

Most approaches emphasize at least implicitly the future-oriented nature of talent, meaning that talent mainly hints at a potential for future top performance and athletic success.

This potential is judged in terms of individual differences in performance relative to opponents' performances. Thus, one's potential to achieve at a national or international competition level implies that one has the potential to perform relatively better than most opponents in the future. Therewith, any understanding of "talent" is necessarily socially-comparative. The concept of talent has therefore to be considered as a very dynamic construct that has many different facets, which, in terms of sport-related performance, are only meaningful in a specific context. To the extent that this context (and thus the performance conditions) changes over time and in relation to environmental conditions, the definition of talent, valid for this context, must also change.

2.2 Theoretical talent development models within sports science

The described terminological and conceptual ambiguity of the concept of talent can also be seen in the variety of theoretical models that are employed within talent research. Bruner et al. (2010) conducted a citation network analysis of seven frequently cited athlete development models and identified two broad subgroups of theoretical models. The first identified subgroup encompasses those models that approach athlete development from a talent perspective (for exemplary models, refer to Abbott and Collins 2004; Bailey and Morley 2006; Côté 1999; Durand-Bush and Salmela 2002; Morgan and Giacobbi 2006). Within research, these models are frequently labelled as talent development models (Bruner et al. 2009, 2010; Coutinho et al. 2016). However, they actually model the development of an athlete from youth sport participation to senior elite sports through separating athletic careers into several stages (Coutinho et al. 2016) without providing any information on what talent means and entails. The second subgroup that Bruner et al. (2010) identified includes those athlete development models that have their origin in the career transition literature (e.g., Stambulova 1994; Wylleman and Lavallee 2004). Despite their different origins in terms of research tradition (i.e., talent and career transition research), both subgroups of models describe athlete (and talent) development as a homogenous, stage-like process, which represents an important limitation. Empirical research on the developmental trajectories of high-achievers shows very idiosyncratic pathways

during which a multitude of factors interact with each other (cf. Durand-Bush and Salmela 2002; Phillips et al. 2010). The complexity of this interplay is extremely high because of the very unique biopsychosocial predispositions of athletes and the dynamics of individual and contextual characteristics over time (cf. Durand-Bush and Salmela 2002; Phillips et al. 2010). Embracing this complexity appears as the most important challenge for theoretical and empirical work within talent research in sports science (Martindale et al. 2005; Rees et al. 2016; Vaeyens et al. 2008).

As a consequence, we find two new groups of talent development models in sports science, namely dynamic systems approaches (e.g., Balague et al. 2013; Phillips et al. 2010; Seifert et al. 2018) and ecological approaches with a focus on the athletic talent development environment (e.g., Henriksen et al. 2010) that both aim to account for complexity.

Dynamic systems approaches in talent-related research in sports science have—by now—mainly been adopted by human movement scientists to propose characteristics of skill acquisition processes (cf. Balague et al. 2013; Phillips et al. 2010). Hence, the focus of such approaches is on expert skill acquisition, which is conceptualized as a process wherein the individual finds functional movement solutions to a motor task that fit to his or her intrinsic dynamics on a cognitive and biological level (cf. Seifert et al. 2018). From this perspective, "talent" is implicitly characterized by the ability to find increasingly advanced movement solutions due to adaptive changes of these intrinsic dynamics (cf. Araújo and Davids 2011; Davids and Araújo 2019). For effective talent development, which is mostly understood in terms of skill development, dynamic systems-oriented researchers and practitioners consequently recommend early sport diversification, variable practice settings with constraints being purposefully manipulated by the coach, and the use of rich and diverse learning environments for general skill transfer (e.g., Seifert et al. 2018).

Through their focus on the acquisition of motor skills, current dynamic systems approaches do not take the broader sociocultural context in which human development is embedded into account. Further, it remains partly unclear what the dynamic system and what the environment encompasses with regard to the phenomenon of talent development. Some scholars understand the developing athlete him- or herself as a dynamic neurobiological system (e.g., Phillips et al. 2010), some authors characterize the process of development of talent or excellence as a dynamic system (e.g., Seifert et al. 2018), while for others, the evolving functional relationship between a performer and a specific performance environment is the dynamic system (e.g., Balague et al. 2013; Davids and Araújo 2019). Thus, talent-related dynamic systems approaches within sports science are incoherent in their use of terminology, particularly with regard to the system concept so that further theoretical work is required.

Whereas dynamic systems approaches still focus predominantly on the individual and individual motor skill acquisition within the direct performance environment, holistic ecological approaches to talent development such as the athletic talent development environment model by Henriksen et al. (2010) shift their focus from the individual athlete to the environment in which development occurs. A strength of such an approach to talent development is that it conceptualizes athlete development as influenced by the context including athletic and non-athletic domains

and structures at the micro- and macro-level, thereby going farther than most dynamic systems approaches do. However, the athletic talent development environment model does not specify how the athlete considered talented develops, how inputs from the environment are processed by the athlete, and in which relation the different systems within the environment of the individual system (i.e., the athlete) stand. Further, these holistic ecological approaches to talent development do not define the construct "talent" itself.

A central gap in talent-related research is the lack of reflection on the organizational perspective. Talent research is mostly based on individual-centered approaches and usually focuses on only one side of the talent development problem, namely that of the person to be promoted. However, what constitutes talent is by no means an incontrovertible quantity. Clubs and associations recruit "talent" based on formally or informally set expectations of biological, social, and psychological competencies. This canon of abilities is not immutable but is continuously changing as a result of a continuous observation of the field, i.e., the people available and the (also continuously changing) sport-specific technical-tactical requirements. In the following, we therefore aim to develop an understanding of talent that considers its multidimensional, dynamic, and context-specific nature. For this purpose, we need a theoretical approach that can capture complex relationships between individual agency and the social context (cf. Cohen et al. 2004).

3 A constructivist model of talent and talent development

With our article, we propose a constructivist understanding of talent. In this regard, we consider *talent as a social construction* that is historically changing and contextually embedded (e.g., Friedman and Rogers 1998). In this context, it is necessary to look at the underlying principles of talent development from an abstract perspective. From an organizational point of view, the purpose of talent development programs is to "produce" top performers who then achieve victories for clubs, associations, or nations. In this sense, talent development is not a promotion simply for the sake of promoting the person considered talented but serves an organizational purpose.

Before we explicate our conceptualization of athletic talent more specifically, we want to provide few general theoretical remarks about organizations. From the perspective of the sociology of organization, the motives, beliefs, or attitudes of people employed within the organization are not in the analytical center; rather, the focus is placed on the analysis of decision-making processes. According to Luhmann (2000b), "organizations emerge and (…) reproduce (themselves) when decisions are communicated" (p. 63). Within organizations, decisions are based on decision premises, which are defined as specific basic decisions of the organization about subsequent decisions (Luhmann 2000b; Thiel and Meier 2004).

With this being said, from an organizational sociological point of view, organizations (such as sports clubs, national sport associations, national youth academies, national youth squads) act, among other things, as "purchasers" of talent in that they decide who receives institutional support (such as instrumental or financial support that are often tied to squad membership) according to their decision premises. Hence,

organizations have to develop ideas about which athletes represent the best fit (in the sense of possessing the set of characteristics that is most promising for success) against the background of the performance conditions within the respective sport (cf. Luhmann 2000b). These expectations are then reflected in the formal and informal selection criteria, which in turn serve as more or less explicit indicators of "talent". In this way, organizations implicitly formulate "talent" descriptions in the form of expectations about the characteristics that athletes must possess to justify institutional support (cf. Smith 2001). From this perspective, talent can be defined as a coherent future-oriented set of specific performance-related expectations of an organization towards potential high performers (cf. Luhmann 2000b). Operationally, in the context of talent selection, these expectations are expressed by specific formal and informal selection criteria, which are used for the selection of potentially suitable individuals. The person considered as promising with regard to the specific performance expectations, in turn, is labelled as "talented".

Sociologically speaking, with the definition of selection criteria, organizations whose purpose is the "production" of top performers, aim to absorb uncertainty when recruiting athletes for their programs (cf. Luhmann 2000a; Thiel and Mayer 2009; Thiel and Meier 2004). The purpose of these organizational "talent" descriptions is to try to ensure that the individuals with the highest chance of being successful are promoted. The idea behind organizational talent development programs is that institutional support mechanisms are only offered to those individuals who possess characteristics that are perceived as valuable and promising for future success within the respective social context (cf. Smith 2001). However, on a more critical note, if we take a closer look at the actual practices of elite sports organizations, we can observe a decoupling between "organizational purpose" and "organizational action". Often, rather than selecting the athletes with the highest potential for later success (i.e., "talk"), sports organizations select the currently highest-performing young athletes (i.e., "action") as evidenced in high annual turnover rates within youth academies or youth squads (Ford et al. 2020; Güllich 2014; Schroepf and Lames 2017). Further, we can observe that the concept and understanding of talent varies widely among the individuals, such as coaches or talent scouts, who are assigned with the task to select the athletes to be promoted by the respective organization (Bergkamp et al. 2021; Jokuschies et al. 2017; Larkin et al. 2020). From an organizational perspective, the lack of inter-individual reliability of talent assessments can be traced back to the high degree of structural variety within sports organizations. Many decisions (such as those for talent identification and selection) are not pre-programmed by formal decision premises but often personalized and delegated to single persons, which allows them to interpret guidelines as they see fit (Thiel and Mayer 2009).

In the context of talent development strategies, two systems that are *structurally coupled* with each other are at the center of intervention efforts. The first relevant system is the organization. Both the processes of talent selection and talent development by sports clubs or sports associations (e.g., via selection squads or Olympic Training Centers) are based on organizational "talent" descriptions, or in other words, the (formal and/or informal) definition of selection criteria that refer to characteristics that are considered directly or indirectly relevant for being successful in the specific field. In this sense, organizations also shape the practical training of individuals who

they consider "talented" (in youth elite academies, Olympic Training Centers, etc.). The second relevant system is the person who is in a lifelong development process, and is always more than just the athlete, because he or she also has to deal with expectations from other environmental systems (e.g., family, school, friends), which have nothing to do with the specific area of "talent", but which can nevertheless affect both current performance and performance development.

Against this background, from an organizational point of view, talent development means making a person fit to the performance expectations of an organization. In this regard, it must be considered that the fit of a person to the expectations of an organization depends not least on how possible deficits in individual performance prerequisites (e.g., in basketball height, speed, stamina) can be compensated for by adaptation strategies on both the organizational and the personal level. However, the organizations' perceptions of what is required for high performance are usually slow to change (cf. Thiel and Mayer 2009). Consequently, a change in performance requirements or a lack of suitable persons who fit the organization's expectations do not necessarily lead to (immediate) changes in selection or development strategies. In addition, people who, from the organization's point of view, are in principle worth to be considered for a talent development program, do not necessarily apprehend that they have to adapt to the expectations of the organization (for example when they assume that they are already fully trained) or have enough motivation and commitment to work on themselves.

Hence, making a person fit to the performance expectations of the organization requires a high degree of flexibility, reflexivity, and, not least, patience from talent development programs. An important aspect in this regard is that personality traits, skills, abilities, and the environment change along the developmental pathway, but they change neither synchronously nor continuously. Rather, developmental multidimensionality, asynchronicity, and discontinuity are central characteristics of systemic change. The development of sports-specific skills, for example, does not occur at the same level and not necessarily at the same timescale as the development of psychological skills. For example, athletes do not grow physically at the same rate as they mature psychologically (Davids and Araújo 2019). Also, the development of social skills is not necessarily concurrent with the development of a cognitive understanding of tactical systems. Finally, development at the different levels does not proceed steadily. In other words, cognitive learning effects in adolescent athletes often happen in leaps and bounds, which also applies to biological changes such as physical growth (Scott and Saginak 2016).

Developmental multidimensionality, asynchronicity, and discontinuity are ultimately the reasons why predicting sporting success in individuals is extremely difficult. Even though sports clubs and associations can use the criteria on which they base talent selection and development as guidance, the assessment of a person as eligible for their programs is subject to extremely high uncertainty. Since personal development is multidimensional and evolves asynchronously on the different dimensions, the assignment of "talent" to a person based on a fixed set of selection criteria becomes extremely complicated. For example, the lack of fit of a selection criterion to the personal characteristics may simply be due to the fact that the person does not grow for a certain period of time or matures psychologically more slowly

(cf. Thiel and Munz 2018). Thus, even if a person has abilities that are extremely promising for success, this does not mean that this person will also be successful in adulthood if it is not possible to set developmental stimuli, which are suitable to the complexity of the person and his or her environment. Hence, talent development needs to be thought of as an iterative process that is highly individualized and idiosyncratic. In recent years, many sports federations such as the German Football Association or UK sports with its talent transfer pathway (Vaeyens et al. 2009) have recognized the necessity and the potential of individualization in their talent identification and development schemes (cf. Faber et al. 2021; Ford et al. 2020). However, the processes and mechanisms of individualized training and development still remain one of the most pressing challenges for future research (BISP 2021; John et al. 2020; Thiel and Munz 2018) and for practical talent development efforts (cf. BISP 2021; Thiel and Munz 2018; Vaeyens et al. 2008).

On their road to top performance, athletes must cope with the structural constraints typical of elite sports such as training standards or competition schedules that require high time investments into training, regeneration, and competition. Given the fact that athletes differ regarding their biological and psychological conditions, the process of how the athlete adapts to the social structures of elite sports is unique in each case. Ensuring that this adaptation succeeds is a very difficult undertaking. In this regard, we postulate three main interferences for talent development that we discuss in more depth in the following: (1) Organizational talent descriptions are constantly changing; (2) the people who come into question as "talents" are shaped by change processes that go far beyond sports-related areas; (3) environmental systems of athletes bring about perturbations whose effects on the athlete's development are very difficult to predict.

3.1 Interference one: The dynamic nature of organizational talent descriptions

Within organizational talent descriptions, talent is not the additive sum of individual talent-related components but rather a dynamic assembly of interrelated components, which—in a performance-related context—are understood as potentially relevant to future performance. Organizational talent descriptions in sports (but also in music or science) comprise directly action-related aspects, such as motor skills, cognitive skills, or tactical knowledge, but also aspects that are indirectly relevant to success, such as motivation, volition, resilience, and the ability to deal productively with challenges (Höner and Feichtinger 2016; MacNamara et al. 2010; Murr et al. 2018).

The social construct of talent, however, is volatile and dynamic. It can be assumed that there are aspects that endure in the long term (e.g., motor skills or motivation), but also aspects that are subject to a stronger imperative for change (e.g., understanding of tactical knowledge), depending on changes in the environment of the respective action system. Thus, the relevance of talent-related components for peak performance varies depending on the given contextual conditions, such as competitive strategies and rules of the discipline. Furthermore, the context in which athletes act changes over time.

References to established selection strategies of the past provide a certain stability in talent selection. However, the establishment of assumed performance prerequi-

sites may well lead to insufficient attention being paid to changes in competition systems due to technical or tactical factors (Baker et al. 2017). Consequently, some individuals who do not meet the usual expectations of performance requirements, but who nevertheless perform excellently at the junior level, might be overlooked for development measures. For example, in the National Football League (NFL), it was long assumed that good quarterbacks had to be tall and have a very strong arm, while the features of running or passing outside the pocket, which were considered valuable for college sports, were considered less significant for the NFL (cf. Berri and Simmons 2011). Accordingly, talent scouting measures were strongly focused on appropriate metrics such as height and hand size, but less on speed (Berri and Simmons 2011). The success of quarterbacks like Russell Wilson or Kyler Murray, who were considered unsuitable for the NFL by quite a few talent scouts not least due to their small height, led to a redefinition of the skills and abilities necessary for a good NFL quarterback. With this being said, the attribution of talent to an individual might change in adaptive or maladaptive ways. When an athlete who has not been identified as "talented" suddenly achieves great athletic success, the attribution of talent to that specific athlete might change adaptively, which usually leads to a changed public understanding of the typical characteristics of a "talent". Vice versa, the set of skills thought to be necessary for peak performance might also change when individuals who have "possessed" this skill set are suddenly no longer successful.

To sum up, the attribution of talent to an individual is relative to a given social context. What we refer to as "talent" is largely impacted by the physical and mental characteristics of current elite athletes. Because of changes in rules or tactics, for instance, the patterns of characteristics that promise success might also change. Thus, organizational talent descriptions need to be dynamic and flexible to account for changes within the respective sports.

3.2 Interference two: The dynamic nature of individual skills

In line with previous works (Den Hartigh et al. 2016; Phillips et al. 2010; Simonton 1999, 2001), we suggest that talent-related skills emerge across the life span. On an organizational level, as discussed previously, talent development means making the athlete fit to the performance expectations of the organization. The process of talent development is characterized by ongoing dynamic interactions between directly and indirectly performance-related factors on the personal level, such as genetics, neurobiology, personality traits (such as perfectionism), psychological skills (such as coping skills and motivation) (e.g., Den Hartigh et al. 2018, 2016), and environmental factors (such as training facilities, competition systems, coaching, familiar support). Against this background, athletes can be understood as emergenic systems. In an emergenic system, the whole, equivalent to the state of the system, is not simply the linear addition of the system's components, but results from dynamic interactions over time, which makes processes of emergence highly idiosyncratic and difficult to predict (Simonton 1999; Thelen 2005).

A typical example in elite sports is the growth process of young athletes. On the one hand, physical growth plays a decisive role in the development of tal-

ent, because athletic performance usually requires a sport specific combination of body proportions. At the same time, growth processes can hinder athletes' trainability because they happen in a non-linear and dimensionally asynchronous fashion, which—particularly during puberty—can cause deficiencies in coordination and musculoskeletal imbalances (Schubring and Thiel 2014a). On the social level, athletes and coaches do not necessarily realize that a performance stagnation of the athlete can be primarily caused by developmental asynchronicity in the individual growth process (Thiel et al. 2015). On the contrary, athletes, particularly if they are under much pressure or are very perfectionistic, tend to try to compensate for performance stagnation by increasing the training load, which, in consequence, can lead to overloading and specific overuse injuries (Schubring and Thiel 2014b). Thus, regarding the individual growth process of athletes, it is often not only the physical changes that impact performance but also how athletes cope with the multiple biological changes (which also interact among themselves), and how the athletes' environment shapes the handling of growth.

In this regard, it is important to keep in mind that the "biopsychosocial homeostasis" of the interplay of success-relevant skills of the athlete in transitional periods is often additionally disturbed by external perturbations.

3.3 Interference three: The impact of perturbations on talent development

From a constructivist perspective, living systems are autopoietic, meaning that they are operationally autonomous, self-referring, and self-constructing (Maturana and Varela 1980; Varela et al. 1974). This has essential implications for talent development. First of all, it means that living systems change in a self-referential way in the regard that each systemic state is dependent on the previous ones, and "every act in every moment is the emergent product of context and history, and no component has causal priority" (Thelen 2005, p. 271). When applying these principles to a person considered talented, it follows that the person generates change of his or her internal bio-psycho-social state by him- or herself. This does not mean that perturbations stemming from the respective social environment (e.g., interventions by the coach, pressure by the training group, or conflicts with the family) cannot precede changes in the behavior of an athlete, but these perturbations do not have a direct cause-and-effect (input-output) relationship. Rather, how the perturbations are processed depends on the current internal structure of the person considered talented but also his or her history and anticipated future. Inputs from a system's environment become information within the system, in that they are *re-constructed* in their meaning against the background of the system's internal logic (cf. Luhmann 1990). As long as the demand for adaptation in a system's environment does not make sense in the system itself, it will not change. Within Fig. 1, we aim to graphically illustrate a constructivist perspective on talent development. In this regard, we specifically visualize the interactive dynamics between various talent-related components and the difference between input and information, which represents a new and important contribution of a constructivist perspective on talent and its development.

With regard to the processing of perturbations, the athlete is usually capable of coping with small disturbances by independently re-adjusting his or her own

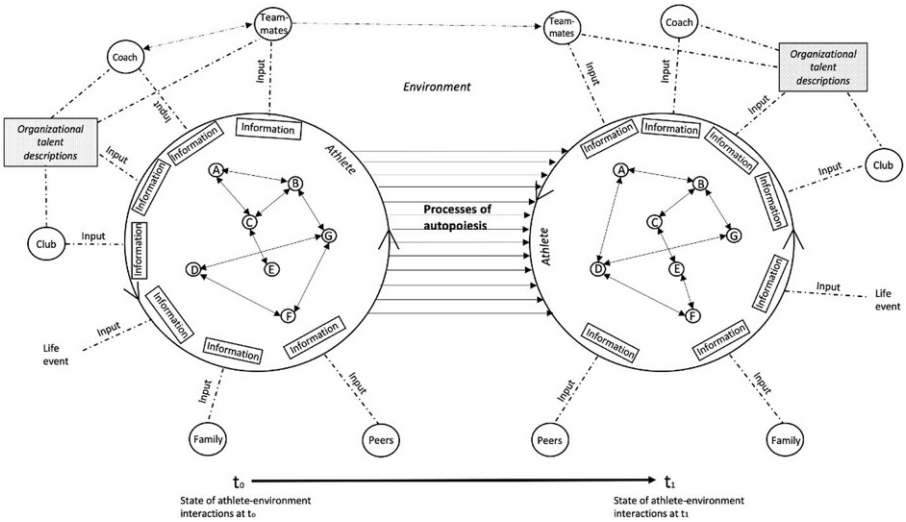

Fig. 1 A constructivist perspective on talent development. (*A–G* Exemplary Talent-Related Components such as Genetics, Neurobiology, Motor Skills, Personality Traits, Motivation, Psychological Skills, etc.)

behavior. However, if perturbations are concentrated in time or cause too much irritation for the system to accommodate, increased variability (for example in terms of performance) can be observed (cf. Vallacher and Nowak 2005), which potentially requires a major change in thinking and behavior so that the system might move into a qualitatively different and more stable state again (cf. Barton 1994; Granic 2005).

Work in general psychology (Bonanno 2004; Linley and Joseph 2004; Tedeschi and Calhoun 2004) as well as work within talent-related research in sports science (Howells et al. 2017; John et al. 2019) indicates that critical life events and transitions can be considered perturbations of the biopsychosocial homeostasis of an athlete. As John et al. (2019) suggest with regard to talent development, the significance of a life event depends on the athlete's internal autopoietic processing of the input. For example, whether an athlete experiences massive self-doubts after a defeat in an important competition or not, likely depends on aspects such as whether it happened for the first time or whether the athlete had already experienced a lot of "unexpected" defeats in major competitions in the past. Thus, environmental inputs gain their significance for talent development only in relation to the athlete's unique history (see in general Thompson 2007), exemplifying the autopoietic and self-referential nature of a living system.

A further typical example for *perturbations* in the process of talent development are changes in the reference group (e.g., entry into a top team). The entry into a top team automatically increases the number of competitors on the same performance level. If the performance development of athletes stagnates after such a transition, for example, because their physical development (height, weight) progresses more slowly than that of their peers, the transition can turn into a crisis that disrupts the biopsychosocial homeostasis of the athlete, even if coaches tell the athlete to be

patient. Often, athletes use cultural narratives on normative or non-normative developmental trajectories (Schubring and Thiel 2014a; Wylleman et al. 2015) as guidance for evaluating their own development and behavior. In the study of Schubring and Thiel (2014b), one athlete developed a growth-related overuse syndrome after the transition to a higher performance level. The pains were conceptualized by the athlete as the result of a misconduct in the sense of not having trained well enough. Such interpretation patterns set in motion a vicious circle that is difficult to break. In case of the injured athlete, the subjectively logic coping strategy was to further increase the training load in order to close the gap with the others. Furthermore, the athlete challenged himself to be more self-disciplined and "punished" himself with rigorous stretching programs (Schubring and Thiel 2014b). This practice subsequently led to an exacerbation of symptoms that was automatically perceived by the athlete as confirmation of his misbehavior and led to further reinforcement of what already had been an unhealthy coping strategy.

This case study shows that successful talent development is to a significant extent dependent on managing "heterostasis" in order to enable a successful continuation of the talent development pathway (cf. Abbott et al. 2005; Abbott and Collins 2004). In elite sports, the coach is usually responsible for initiating such behavioral changes. However, the willingness to change as a result of an intervention depends on whether such an adaptation makes sense for the athlete. From a constructivist perspective, perturbations can initiate a process of self-reflection, and, if necessary, change. Generally, we argue that athletes—in order to change performance-limiting behavior—do not necessarily have to be forced into unstable states to trigger transitions—as Phillips et al. (2010) suggest. Instead, naturally occurring critical life events (cf. Filipp 1995), both inside (e.g., new coach, contact with a role model, being deselected from a team) and outside of the performance domain (e.g., illness of a family member, start of a romantic relationship, losing a loved one), can generate irritations of the internal homeostasis of the athlete and lead to self-reflective processes, which subsequently may initiate transitions to new modes of behavior (cf. John et al. 2019).

4 Implications for talent research and practice

4.1 Methodological consequences and avenues for future research

When looking at talent development from a constructivist perspective, idiographic and multidisciplinary approaches are recommended for research on talent development. In this regard, particular attention should be paid to temporal aspects of the developmental process such as intra-individual variability, trajectories over developmental time, and the underlying mechanisms of change, with temporal variability representing key information (Lichtwarck-Aschoff et al. 2008; Vallacher et al. 2002). One could even go as far as arguing that research should not focus its attention on finding explanations in the sense of detecting cause-effect relationships but should rather set the focus on identifying dynamic biopsychosocial patterns over time, such

as typical vulnerable transitions, or health- and performance-related behavioral vicious cycles.

Methodologically, research on talent development, in the sense of making a person fit to the performance expectations of an organization, requires idiographic, unaveraged, and frequent measurements that allow to examine individual trajectories of development rather than group averages (cf. Hayes et al. 2007). Thus, the application of single-subject, time-series approaches to assessment may be warranted (Heiby 1995). These methodological approaches would allow to identify time points in a longitudinal data set when disproportionate changes in parametric values occur. However, such approaches, if applied to phenomena such as the emergence and development of performance-related skills and abilities, might have to encompass time spans of up to 20 years or more. Time limits and financial constraints often make it nearly impossible to gather real-time, time-series data, especially since researchers interested in the emergence of talent over developmental time would need to follow a large number of "potential" elite athletes from childhood to adulthood. However, given the technological advances to monitor athletes on a regular basis, this should be a core strategy in future talent research.

In line with a social constructivist perspective, we argue that another potentially relevant line of inquiry might be the reconstructive interpretation of an athlete's biography verbalized in the form of a life story. Analyzing individual "stories" of athletes about their development could help to understand the intrinsic dynamics of talent development pathways. Life stories offer insights into the trajectories of lives across time. Storytellers connect events, transitions, critical developmental milestones as well as strategies of coping with such experiences in a subjectively meaningful manner in their life stories. In this sense, the analysis of life stories is particularly suited to examine how perturbations are perceived and processed from the perspective of those that actually experience(d) the pathway (John and Thiel 2022). In this regard, longitudinal and non-longitudinal narrative interviews with current athletes and drop-outs offer the possibility to learn more about the opportunities and pressures of athletic careers.

Further, future talent research might benefit from a focus on the level of the organization. Here, talent research could critically examine sports organizations' talent selection decisions as well as the underlying decision premises and their establishment within the organizational structure. Research could also investigate the origins and mechanisms of bias in these selection decisions. In this context, it also appears relevant for talent research to develop ideas about the future of sports itself (Baker et al. 2017) and investigate ways how sports organizations could take these possible future developments into account to reduce the amount of uncertainty within their decision premises.

4.2 Practical implications

For practitioners within the field of talent development, it is essential to keep in mind that people's development is not only inter-individually different, but also intra-individually multidimensional, asynchronous, and discontinuous. Physical growth does not necessarily happen at the same speed as intellectual growth; psychological

maturity does not necessarily evolve at the same time as social maturity. Such asynchronous developments can lead to problems, for example, when coaches who are unaware of these asynchronicities expect athletes to behave maturely only because they are physically mature.

In the talent-related monitoring of athletes, it is therefore important to look not only at the directly performance-related aspects, but also at motivational and affective states, the involvement of athletes in social networks, life events, and the interaction of these factors. In this regard, talent development strategies have to focus on the performer as an individual rather than using generic strategies that might not fit to every athlete's inner and outer environment. Without an understanding of the meaning-making process on behalf of the athlete, the coach will not be able to offer the conditions necessary for the very specific athlete to succeed, not least because the athlete's logic of behavior is neglected.

Given that the subjective relevance of life events and transitions with regard to one's own development depends on the way the athlete gives meaning to these events, particular attention should be paid to how the athlete "narrates" the respective life event. Guiding self-reflection can only work if there is a key to the athlete's thinking. Hence, it is important that coaches initiate conversations with athletes in which the need for behavior change is articulated in a way that connects to the athletes' thinking logic. If it is possible to convince the athlete of the necessity of a change in behavior (for example, by making it comprehensibly clear that a break will lead to a significant improvement in performance), the likelihood increases that self-reflective processes resulting in adaptive behavioral changes happen. However, the occurrence of life events can neither be controlled by the athlete nor his or her supporting actors. Thus, it appears crucial to prepare athletes to cope appropriately if such events happen. In this context, athletes can be taught adequate coping strategies, such as problem- and emotion-focused coping strategies and reflective activity (John et al. 2019; Nicholls and Polman 2007), and guided to subsequently employ them during and after a life event-related experience.

However, in practice, limited time resources on part of the coach often collide with the complexity of an idiographic approach to talent development so that coaches are also dependent on generalizations in parts of their work. Research on typical vulnerable transitions and coping patterns could at least provide knowledge for coaches on possible developments, and thereby provide a framework for individualized coaching practices. Generally, athletes are particularly vulnerable in transition phases. Coaches should therefore monitor performance stagnations after such transitions very carefully and pay attention to how athletes cope with such stagnations. Increasing training volumes, adding new members into a training group, or switching to a higher competition level should only be done during stable developmental periods (when no critical transitions for example in the educational or vocational domain or in the living conditions happen) so that the probability of maladaptation (with the effect of lowering psychological well-being or performance) is reduced.

Furthermore, coaches must not assume that their inputs (such as introduction of new techniques, change in training strategies) eventually create intended effects. From a constructivist perspective, environmental inputs gain their meaning in a self-referential manner based on the internal logic of the person who is considered

talented. Talent development is therefore highly dependent on communication skills (cf. Borggrefe et al. 2006), particularly questioning techniques, the ability to listen, and so-called mirroring techniques.

On an organizational level, organizations that are responsible for talent development must consider the dynamic nature of elite sports. They must be prepared to question their decision premises in the promotion of "talented" individuals when changes occur in the organization's environment (in the internal elite sports environment, for example, changes in the rules and regulations or in competition systems; in the external environment, for example, when there are not enough people who fulfill the organization's performance expectations).

Talent-related organizational decision premises in sports, however, are often the result of power processes. This can be observed, for example, when very successful coaches describe certain performance requirements as indispensable for athletic success, although these "requirements" are only representative of those individuals who have developed into successful athletes under the coach's supervision. Behind this lies the problem that the attribution of talent to a young athlete is mostly dependent on the subjective assessments of coaches who have gained their knowledge on the basis of their own previous experiences and constructions of reality (Lath et al. 2021). However, it is by no means certain that coaches, even if they are very experienced, can really assess every individual athlete's prospect of success well based on their own previous experiences. In terms of talent development, coaches must therefore be open to the fact that their assumptions can also be wrong, and regularly question their own assumptions.

5 Conclusion

In this paper, we have proposed a constructivist conceptualization of athletic talent that can build the basis for more context specific work on talent and its development within sports and beyond. At the heart of our conceptualization of talent is the idea that "talent" is nothing more than a social construction that is subject to contextual and historical processes of change. Through formulating selection criteria, organizations aim to select those individuals with the highest probability of athletic success. These formal and informal selection criteria serve at least implicitly as "talent" descriptions from the organizational point of view. In this sense, the definition of the construct talent in elite sports is not located at the level of the person to be promoted but is the result of (sport) organizational observations of requirements in the field and a derivation of a necessary complex of abilities based on this. Within our constructivist conceptualization of talent, we specifically pay attention to the intrinsic dynamics of the social construction of talent and the individual skills. We argue that, due to the self-referential nature of living systems, perturbations from the outside environment and their biographically shaped processing on behalf of the individual are constitutive for initiating developmental change during talent development.

Our constructivist considerations lead us to the conclusion that it is not sufficient for successful talent development to determine only the determinants of an individual's athletic performance development. Rather, the active role of sports or-

ganizations in determining what talent is and how it is to be supported, must also be considered in a model of talent development. Our constructivist view of talent development suggests that the promotion of promising individuals should be understood as a process of "matching" a person deemed to be talented with organizational talent-related expectations. Therewith, a focus on the person to be promoted is not sufficient to optimally develop the ability prerequisites considered necessary for top performance in the available human capital specific to competitive sports. If, for example, tactics, rules, or even sports equipment change in the field, the talent expectations of clubs and associations may no longer adequately reflect the skills necessary for top performance. In this case, the sports organization would have to change its idea of the canon of skills necessary for top performance (cf. Baker et al. 2017). If something changes in the available human capital (e.g., changed motivational structures due to changes in education or a smaller number of potential top athletes due to demographic changes or a decline in the attractiveness of a sport), the talent development strategies of clubs and associations will have to change in response. Both processes of change would mean an organizational change, which would have to be reflected as an organizational learning process, meaning a change in informal or formal organizational structures.

For the practical promotion of talent, this implies not only thinking about measures to best nurture the biological, psychological, and social characteristics of an individual that are considered relevant to performance, but also to engage in organizational learning in the sense of adapting organizational talent expectations to the available "human capital" as well as to technical-tactical changes in the sport itself.

Acknowledgements We would like to thank Hannes Gropper for his thoughtful comments on the previous versions of the manuscript.

Funding No funds, grants, or other support was received. Open Access funding enabled and organized by Projekt DEAL.

Conflict of interest J.M. John and A. Thiel declare that they have no competing interests.

References

Abbott, A., & Collins, D. (2002). A theoretical and empirical analysis of a "state of the art" talent identification model. *High Ability Studies*, *13*(2), 157–178. https://doi.org/10.1080/1359813022000048798.

Abbott, A., & Collins, D. (2004). Eliminating the dichotomy between theory and practice in talent identification and development: considering the role of psychology. *Journal of Sports Sciences*, *22*(5), 395–408. https://doi.org/10.1080/02640410410001675324.

Abbott, A., Button, C., Pepping, G.-J., & Collins, D. (2005). Unnatural selection: talent identification and development in sport. *Nonlinear Dynamics, Psychology, and Life Sciences*, *9*(1), 61–88.

Araújo, D., & Davids, K. (2011). Talent development: from possessing gifts to functional environmental interactions. *Talent Development & Excellence*, *3*(1), 23–25.
Bailey, R., & Morley, D. (2006). Towards a model of talent development in physical education. *Sport, Education and Society*, *11*(3), 211–230. https://doi.org/10.1080/13573320600813366.
Baker, J., Schorer, J., & Wattie, N. (2017). Compromising talent: Issues in identifying and selecting talent in sport. *Quest*, *70*(1), 1–16. https://doi.org/10.1080/00336297.2017.1333438.
Baker, J., Wattie, N., & Schorer, J. (2019). A proposed conceptualization of talent in sport: the first step in a long and winding road. *Psychology of Sport and Exercise*, *43*, 27–33. https://doi.org/10.1016/j.psychsport.2018.12.016.
Baker, J., Wilson, S., Johnston, K., Dehghansai, N., Koenigsberg, A., de Vegt, S., & Wattie, N. (2020). Talent research in sport 1990–2018: a scoping review. *Front Psychol*, *11*, 607710. https://doi.org/10.3389/fpsyg.2020.607710.
Balague, N., Torrents, C., Hristovski, R., Davids, K., & Araújo, D. (2013). Overview of complex systems in sport. *Journal of Systems Science and Complexity*, *26*(1), 4–13. https://doi.org/10.1007/s11424-013-2285-0.
Barton, S. (1994). Chaos, self-organization, and psychology. *American Psychologist*, *49*(1), 5–14.
Bergkamp, T.L.G., Frencken, W.G.P., Niessen, A.S.M., Meijer, R.R., & den Hartigh, R.J.R. (2021). How soccer scouts identify talented players. *European Journal of Sport Science*. https://doi.org/10.1080/17461391.2021.1916081.
Berri, D.J., & Simmons, R. (2011). Catching a draft: On the process of selecting quarterbacks in the National Football League amateur draft. *Journal of Productivity Analysis*, *35*(1), 37–49.
BISP (2021). Leistungsreserve Individualisierung Bundesinstitut für Sportwissenschaft. https://www.bisp.de/SharedDocs/Downloads/Ausschreibungen/AusschreibungWVLIndividualisierung.pdf. Accessed: 22 June 2022.
Bonanno, G.A. (2004). Loss, trauma, and human resilience: Have we underestimated the human capacity to thrive after extremely aversive events? *American Psychologist*, *59*(1), 20–28. https://doi.org/10.1037/0003-066X.59.1.20.
Borggrefe, C., Thiel, A., & Cachay, K. (2006). *Sozialkompetenz von Trainerinnen und Trainern im Spitzensport [The social competence of coaches in elite sports*. Hellenthal: Sportverlag Strauß.
Brown, J. (2002). *Sports Talent. How to identify and develop outstanding athletes.* Human Kinetics.
Bruner, M.W., Erickson, K., McFadden, K., & Côté, J. (2009). Tracing the origins of athlete development models in sport: a citation path analysis. *International Review of Sport and Exercise Psychology*, *2*(1), 23–37. https://doi.org/10.1080/17509840802687631.
Bruner, M.W., Erickson, K., Wilson, B., & Côté, J. (2010). An appraisal of athlete development models through citation network analysis. *Psychology of Sport and Exercise*, *11*(2), 133–139. https://doi.org/10.1016/j.psychsport.2009.05.008.
Cohen, L., Duberley, J., & Mallon, M. (2004). Social constructionism in the study of career: Accessing the parts that other approaches cannot reach. *Journal of Vocational Behavior*, *64*(3), 407–422. https://doi.org/10.1016/j.jvb.2003.12.007.
Colvin, G. (2010). *Talent is overrated: What really separates world-class performers from everybody else*. München: Penguin.
Coutinho, P., Mesquita, I., & Fonseca, A.M. (2016). Talent development in sport: A critical review of pathways to expert performance. *International Journal of Sports Science & Coaching*, *11*(2), 279–293. https://doi.org/10.1177/1747954116637499.
Csikszentmihalyi, M., Rathunde, K., & Whalen, S. (1993). *Talented teenagers: The roots of success and failure*. Cambridge University Press.
Côté, J. (1999). The influence of the family in the development of talent in sport. *The Sport Psychologist*, *13*, 395–417. https://doi.org/10.1123/tsp.13.4.395.
Davids, K., & Araújo, D. (2019). *Innate Talent in Sport: Beware of an organismic asymmetry-comment on Baker & Wattie. Current Issues in Sport*. CISS: Science.
Den Hartigh, R.J.R., Van Dijk, M.W., Steenbeek, H.W., & Van Geert, P.L. (2016). A dynamic network model to explain the development of excellent human performance. *Frontiers in Psychology*, *7*, 532. https://doi.org/10.3389/fpsyg.2016.00532.
Den Hartigh, R.J.R., Hill, Y., & Van Geert, P.L.C. (2018). The development of talent in sports: A dynamic network approach. *Complexity*. https://doi.org/10.1155/2018/9280154.
Durand-Bush, N., & Salmela, J.H. (2002). The development and maintenance of expert athletic performance: Perceptions of World and Olympic champions. *J Appl Sport Psychol*, *14*, 154–171. https://doi.org/10.1080/10413200290103473.

Ericsson, K. A., Krampe, R. T., & Tesch-Römer, C. (1993). The role of deliberate practice in the acquisition of expert performance. *Psychological Review*, *100*(3), 363–406. https://doi.org/10.1037/0033-295X.100.3.363.

Faber, I. R., Bustin, P. M., Oosterveld, F. G., Elferink-Gemser, M. T., & Nijhuis-Van der Sanden, M. W. (2016). Assessing personal talent determinants in young racquet sport players: A systematic review. *Journal of Sports Sciences, 34*(5), 395-410. https://doi.org/10.1080/02640414.2015.1061201.

Faber, I. R., Sloot, L., Hoogeveen, L., Elferink-Gemser, M. T., & Schorer, J. (2021). Western Approaches for the identification and development of talent in schools and sports contexts from 2009to 2019—a literature review. *High Ability Studies*, 1–34. https://doi.org/10.1080/13598139.2021.1900792

Filipp, S.-H. (1995). Ein allgemeines Modell für die Analyse kritischer Lebensereignisse [A general model for the analysis of critical life events]. In S.-H. Filipp (Ed.), *Kritische Lebensereignisse [Critical life events]* (3rd edn., pp. 3–52). Weinheim: Psychologie Verlags Union.

Ford, P. R., Bordonau, J. L. D., Bonanno, D., Tavares, J., Groenendijk, C., Fink, C., Gualtieri, D., Gregson, W., Varley, M. C., Weston, M., Lolli, L., Platt, D., & Di Salvo, V. (2020, Jun–Jun). A survey of talent identification and development processes in the youth academies of professional soccer clubs from around the world. *J Sports Sci, 38*(11–12), 1269–1278. https://doi.org/10.1080/02640414.2020.1752440

Friedman, R. C., & Rogers, K. B. (1998). *Talent in context: Historical and social perspectives on giftedness*. American Psychological Association. https://doi.org/10.1037/10297-000.

Gabler, H., & Ruoff, B. A. (1979). Zum Problem der Talentbestimmung im Sport [On the problem of conceptualizing talent in sport]. *Sportwissenschaft, 9*(2), 164-180.

Gagné, F. (1995). From giftedness to talent: A developmental model and its impact on the language of the field. *Roeper Review, 18*(2), 103-112. https://doi.org/10.1080/02783199509553709.

Gallardo-Gallardo, E., Dries, N., & González-Cruz, T. F. (2013). What is the meaning of "talent" in the world of work? *Human Resource Management Review, 23*(4), 290–300. https://doi.org/10.1016/j.hrmr.2013.05.002

Galton, F. (1869). *Hereditary Genius: An Inquiry into its Laws and Consequences*. London: Macmillan. https://doi.org/10.1037/13474-000.

Galton, F. (1875). *The history of twins, as a criterion of the relative powers of nature and nurture. Fraser's* (pp. 566–576).

Granic, I. (2005). Timing is everything: Developmental psychopathology from a dynamic systems perspective. *Developmental Review, 25*(3–4), 386–407. https://doi.org/10.1016/j.dr.2005.10.005

Gray, H. J., & Plucker, J. A. (2010). "She's a natural": Identifying and developing athletic identity. *Journal for the Education of the Gifted*, *33*(3), 361–380.

Gruber, H. E. (1998). The social construction of extraordinary selves: Collaboration among unique creative people. In R. C. Friedman & K. B. Rogers (Eds.), *Talent in context: Historical and social perspectives on giftedness* (pp. 127–147). American Psychological Association. https://doi.org/10.1037/10297-007

Güllich, A. (2013). Talente im Sport [Talents in Sport]. In A. Güllich & M. Krüger (Eds.), *Sport. Das Lehrbuch für das Sportstudium [Sport. The book for sport science students]* (pp. 623–653). Wiesbaden: Springer. https://doi.org/10.1007/978-3-642-37546-0_17.

Güllich, A. (2014). Selection, de-selection and progression in German football talent promotion. *Eur J Sport Sci*, *14*(6), 530–537. https://doi.org/10.1080/17461391.2013.858371.

Güllich, A., Macnamara, B. N., & Hambrick, D. Z. (2021). *What Makes a Champion? Early Multidisciplinary Practice, Not Early Specialization, Predicts World-Class*. https://doi.org/10.1177/1745691620974772. ISBN 1745691620974772.

Hayes, A. M., Laurenceau, J. P., Feldman, G., Strauss, J. L., & Cardaciotto, L. (2007). Change is not always linear: The study of nonlinear and discontinuous patterns of change in psychotherapy. *Clinical Psychology Review*, *27*(6), 715–723. https://doi.org/10.1016/j.cpr.2007.01.008.

Heiby, E. M. (1995). Chaos theory, nonlinear dynamical models, and psychological assessment. *Psychological Assessment*, *7*(1), 5–9.

Henriksen, K., Stambulova, N., & Roessler, K. K. (2010). Holistic approach to athletic talent development environments: A successful sailing milieu. *Psychology of Sport and Exercise*, *11*(3), 212–222. https://doi.org/10.1016/j.psychsport.2009.10.005.

Höner, O., & Feichtinger, P. (2016). Psychological talent predictors in early adolescence and their empirical relationship with current and future performance in soccer. *Psychology of Sport and Exercise*, *25*, 17–26. https://doi.org/10.1016/j.psychsport.2016.03.004.

Howells, K., Sarkar, M., & Fletcher, D. (2017). Can athletes benefit from difficulty? A systematic review of growth following adversity in competitive sport. *Progress in Brain Research*, *234*, 117–159. https://doi.org/10.1016/bs.pbr.2017.06.002.

John, J.M. & Thiel, A. (2022). All roads lead to Rome? Talent narratives of elite athletes, musicians, and mathematicians. *Qualitative Research in Sport, Exercise and Health.* https://doi.org/10.1080/2159676X.2022.2074078.

John, J. M., Gropper, H., & Thiel, A. (2019). The role of critical life events in the talent development pathways of athletes and musicians: A systematic review. *Psychology of Sport and Exercise*. https://doi.org/10.1016/j.psychsport.2019.101565.

John, J. M., Haug, V., & Thiel, A. (2020, 2020/10/17). Physical Activity Behavior from a Transdisciplinary Biopsychosocial Perspective: a Scoping Review. *Sports Medicine-Open, 6*(1), 49. https://doi.org/10.1186/s40798-020-00279-2

Johnston, K., Wattie, N., Schorer, J., & Baker, J. (2018). Talent identification in sport: a systematic review. *Sports Medicine*, *48*(1), 97–109.

Jokuschies, N., Gut, V., & Conzelmann, A. (2017). Systematizing coaches'"eye for talent": Player assessments based on expert coaches' subjective talent criteria in top-level youth soccer. *International Journal of Sports Science & Coaching, 12*(5), 565–576. https://doi.org/10.1177/1747954117727646

Larkin, P., Marchant, D., Syder, A., & Farrow, D. (2020). An eye for talent: The recruiters' role in the Australian Football talent pathway. *PLoS One, 15*(11), e0241307. https://doi.org/10.1371/journal.pone.0241307

Lath, F., Koopmann, T., Faber, I., Baker, J., & Schorer, J. (2021). Focusing on the coach's eye-towards a working model of coach decision-making in talent selection. *Psychology of Sport and Exercise*, *102011*. https://doi.org/10.1016/j.psychsport.2021.102011.

Lichtwarck-Aschoff, A., van Geert, P., Bosma, H., & Kunnen, S. (2008). Time and identity: A framework for research and theory formation. *Developmental Review*, *28*(3), 370–400. https://doi.org/10.1016/j.dr.2008.04.001.

Linley, P. A., & Joseph, S. (2004). Positive change following trauma and adversity: A review. *Journal of Traumatic Stress*, *17*(1), 11–21. https://doi.org/10.1023/B:JOTS.0000014671.27856.7e.

Luhmann, N. (1990). *Die Wissenschaft der Gesellschaft [The science of society*]. Berlin: Suhrkamp.

Luhmann, N. (2000a). Die Paradoxie des Entscheidens. In N. Luhmann (Ed.), *Organisation und Entscheidung* (pp. 123–151). Wiesbaden: Springer. https://doi.org/10.1007/978-3-322-97093-0_4.

Luhmann, N. (2000b). *Organisation und Entscheidung [Organization and decision]*. Wiesbaden: VS. https://doi.org/10.1007/978-3-322-97093-0.

MacNamara, Á., Button, A., & Collins, D. (2010). The role of psychological characteristics in facilitating the pathway to elite performance Part 1: Identifying mental skills and behaviors. *The Sport Psychologist*, *24*(1), 52–73. https://doi.org/10.1123/tsp.24.1.52.

Martindale, R. J., Collins, D., & Daubney, J. (2005). Talent development: A guide for practice and research within sport. *Quest*, *57*(4), 353–375. https://doi.org/10.1080/00336297.2005.10491862.

Maturana, H. R., & Varela, F. J. (1980). *Autopoiesis and cognition: The realization of the living*. Dordrecht: D. Reidel Publishing Company.

Morgan, T. K., & Giacobbi, P. R. (2006). Toward two grounded theories of the talent development and social support process of highly successful collegiate athletes. *The Sport Psychologist*, *20*(3), 295–313. https://doi.org/10.1123/tsp.20.3.295.

Murr, D., Feichtinger, P., Larkin, P., O'Connor, D., & Honer, O. (2018). Psychological talent predictors in youth soccer: A systematic review of the prognostic relevance of psychomotor, perceptual-cognitive and personality-related factors. *PLoS One*, *13*(10), e205337. https://doi.org/10.1371/journal.pone.0205337.

Nicholls, A. R., & Polman, R. C. J. (2007). Coping in sport: A systematic review. *Journal of Sports Sciences*, *25*(1), 11–31. https://doi.org/10.1080/02640410600630654.

Phillips, E., Davids, K., Renshaw, I., & Portus, M. (2010). Expert performance in sport and the dynamics of talent development. *Sports Medicine*, *40*(4), 271–283. https://doi.org/10.2165/11319430-000000000-00000.

Rees, T., Hardy, L., Güllich, A., Abernethy, B., Cote, J., Woodman, T., Montgomery, H., Laing, S., & Warr, C. (2016). The Great British Medalists Project: A review of current knowledge on the development of the world's best sporting talent. *Sports Medicine*, *46*(8), 1041–1058. https://doi.org/10.1007/s40279-016-0476-2.

Schroepf, B., & Lames, M. (2017). Career patterns in German football youth national teams—A longitudinal study. *International Journal of Sports Science & Coaching*, *13*(3), 405–414. https://doi.org/10.1177/1747954117729368.

Schubring, A., & Thiel, A. (2014a). Coping with growth in adolescent elite sport. *Sociology of Sport Journal*, *31*(3), 304–326. https://doi.org/10.1123/ssj.2013-0071.
Schubring, A., & Thiel, A. (2014b). Growth problems in youth elite sports. Social conditions, athletes' experiences and sustainability consequences. *Reflective Practice*, *15*(1), 78–91. https://doi.org/10.1080/14623943.2013.868793.
Scott, S. K., & Saginak, K. A. (2016). Adolescence: Physical and cognitive development. In D. Capuzzi & M. D. Stauffer (Eds.), *Human growth and development across the lifespan: Applications for counselors* (pp. 309–346). New York: Wiley.
Seifert, L., Papet, V., Strafford, B. W., Gogliani, A., & Davids, K. (2018). Skill transfer, expertise and talent development: An ecological dynamics perspective. *Movement Sport Sciences*, *4*, 39–49. https://doi.org/10.1051/sm/2019010.
Simonton, D. K. (1999). Significant sample: The psychological study of eminent individuals. *Psychological Methods*, *4*(4), 425–451.
Simonton, D. K. (2001). Talent development as a multidimensional, multiplicative, and dynamic process. *Current Directions in Psychological Science*, *10*(2), 39–43.
Smith, S. R. (2001). The social construction of talent: a defence of justice as reciprocity. *Journal of Political Philosophy*, *9*(1), 19–37. https://doi.org/10.1111/1467-9760.00116.
Stambulova, N. B. (1994). Developmental sports career investigations in Russia: a post-perestroika analysis. *The Sport Psychologist*, *8*(3), 221–237. https://doi.org/10.1123/tsp.8.3.221.
Tedeschi, R. G., & Calhoun, L. G. (2004). Posttraumatic growth: conceptual foundations and empirical evidence. *Psychological Inquiry*, *15*(1), 1–18. https://doi.org/10.1207/s15327965pli1501_01.
Thelen, E. (2005). Dynamic systems theory and the complexity of change. *Psychoanalytic dialogues*, *15*(2), 255–283. https://doi.org/10.1080/10481881509348831.
Thiel, A., & Mayer, J. (2009). Characteristics of voluntary sports clubs management: a sociological perspective. *European sport management quarterly*, *9*(1), 81–98. https://doi.org/10.1080/16184740802461744.
Thiel, A., & Meier, H. (2004). Überleben durch Abwehr-Zur Lernfähigkeit des Sportvereins/Survival through Resistance—About the Learning Capability of Sports Organizations. *Sport und Gesellschaft*, *1*(2), 103–124.
Thiel, A., & Munz, B. (2018). Individualized training as a biopsychosocial challenge-interlinking epigenetics, social sciences and psychology in sport scientific research. *European Journal for Sport and Society*, *15*(3), 211–215. https://doi.org/10.1080/16138171.2018.1500116.
Thiel, A., Schubring, A., Schneider, S., Zipfel, S., & Mayer, J. (2015). Health in elite sports—a "bio-psycho-social" perspective. *Deutsche Zeitschrift für Sportmedizin*, *66*(9), 241–248.
Thompson, E. (2007). *Mind in life: biology, phenomenology, and the sciences of mind*. Harvard: University Press.
Tranckle, P., & Cushion, C. J. (2006). Rethinking giftedness and talent in sport. *Quest*, *58*(2), 265–282. https://doi.org/10.1080/00336297.2006.10491883.
Vaeyens, R., Lenoir, M., Williams, A. M., & Philippaerts, R. M. (2008). Talent identification and development programmes in sport. *Sports Medicine*, *38*(9), 703–714. https://doi.org/10.2165/00007256-200838090-00001.
Vaeyens, R., Güllich, A., Warr, C. R., & Philippaerts, R. (2009). Talent identification and promotion programmes of Olympic athletes. *Journal of Sports Sciences*, *27*(13), 1367–1380.
Vallacher, R. R., & Nowak, A. (2005). Dynamical social psychology: finding order in the flow of human experience. In A. W. Kruglanski & E. T. Higgins (Eds.), *Social psychology: handbook of basic principles*. New York: Guilford.
Vallacher, R. R., Read, S. J., & Nowak, A. (2002). The dynamical perspective in personality and social psychology. *Personality and Social Psychology Review*, *6*(4), 264–273. https://doi.org/10.1207/S15327957PSPR0604_01.
Varela, F. G., Maturana, H. R., & Uribe, R. (1974). Autopoiesis: the organization of living systems, its characterization and a model. *Biosystems*, *5*(4), 187–196.
Williams, A. M., & Reilly, T. (2000). Talent identification and development in soccer. J*ournal of Sports Sciences, 18*(9), 657-667. https://doi.org/10.1080/02640410050120041.
Wylleman, P., & Lavallee, D. (2004). A developmental perspective on transitions faced by athletes. In M. Weiss (Ed.), *Developmental sport and exercise psychology: a lifespan perspective* (pp. 507–527).
Wylleman, P., Rosier, N., & Knop, P. D. (2015). Transitional challenges and elite athletes' mental health. In J. Baker, P. Safai & J. Fraser-Thomas (Eds.), *Health and elite sport* (pp. 99–116). London: Routledge.