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Understanding the Role of the Talent Development Environment in Fostering Sporting Excellence: A Review

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Abstract

With increasing competitiveness in professional sport, countries and sports organizations are seeking to optimize their athletes' sports performance. The talent development environment is an important factor contributing to athletic success. This review aims to synthesize existing literature pertaining to the talent development environment. The results of this review provided a contemporary understanding of the essential components of talent development environment (e.g., long-term development and support network), as well as their differential and holistic role in fostering talent development. The influence of talent development environments on athletic success was explored through the lens of achievement goal theory and self-determination theory. Constructs of these two theories were found to relate to the components of the talent development environment. Despite the growing literature aimed at understanding the talent development environment, issues and gaps in the existing literature were identified. Future research directions were proposed to advance this critical research area.

Keywords: talent development, environmental factors, research synthesis, motivation, sport.

1. Introduction

With increasing competitiveness in professional sport, countries and organizations seeking to optimize performance of their athletes have increasingly adopted talent identification and development programs (Li et al., 2014, 2016; Wang et al., 2016; Wang et al., 2011). Talent identification refers to spotting those with potential or innate abilities for attaining elite-level performance, while talent development concerns the handling of "talent", nurturing them within a conducive environment, towards world-class aptitude (Li et al., 2014). Talent identification and development programs, if successful, may promote sustainable and quality performance at the international level (Martindale et al., 2007; Wang et al., 2011).

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The emerging consensus around interaction between innate and environmental influence in the nature-nurture debate underlies the importance of both talent identification and talent development towards fostering athletic excellence (Abbott et al., 2002). The intuitive claim that innate ability cannot instantly translate into a world-class performance standard has been argued by many in academia (Gagné, 2004; Li et al., 2015; Vaeyens et al., 2008, Lenoir et al., 2008) and supported by empirical evidence. For instance, evidence has been found for plasticity in joint flexibility and strength in measures predictive of success in competitive swimming (Bloomfield et al., 1990). In fact, Bloomfield and colleagues (1990) found no differences in the flexibility of adolescent swimmers and non-swimmers, suggesting differentiation that grows with training. Thus, where talent identification is important in differentiating those who can and cannot attain excellence (Gagné, 2004), talent development can alter the value of physical factors predictive of sporting success (Abbott et al., 2002).

Some, however, suggest that talent identification initiatives are affected by inherent problems. While supporting the importance of interaction between talent identification and talent development, the multidimensionality of sport performance (e.g., technical skills and physical ability) also confounds the effectiveness of talent identification programs, which face difficulties in early and accurate identification of future top performers (Abbott et al., 2002; Abbott, Collins, 2004; Vaeyens et al., 2008). Furthermore, an overemphasis on "selecting" talented individuals arguably creates ethical problems (Abbott et al., 2002). These issues, alongside sparse scientific grounding for talent identification programs, has prompted a shifting emphasis towards talent development (Martindale et al., 2010; Vaeyens et al., 2008; Wang et al., 2016). The relative importance of talent development in the emergence of top talent should not be discounted. After all, expertise grows from an interaction between an individual, however gifted, and his or her environment (Barab, Plucker, 2002). As such, the talent development environment is a key factor towards successful performance among world-class athletes, who stand to benefit from well-structured, holistic programs aimed at maximizing their potential (Martindale et al., 2005).

The purpose of this research is to review and synthesize the literature pertaining to talent development environment. The practical importance and growing literature in talent development environment warrants review, condensing existing work towards an updated collective understanding on the topic. In addition, this paper will examine emerging attempts to understand the underlying operation of the talent development environment in enabling sporting achievement through psychological perspectives, which may have implications on the development of effective talent development programs. Finally, it will address limitations in current research and opportunities for progress in the field.

2. Discussion and results

Essentials of Talent Development Environment

Though generally understood as "all aspects of the coaching situation" (Martindale et al., 2005), scholars have sought to identify specific aspects of talent development environments. One approach involved the development of the Talent Development Environment Questionnaire (TDEQ), which serves the dual purpose of understanding constituent aspects of the TDE and providing a tool to evaluate these aspects in given environments (Li et al., 2015; Martindale et al., 2010). Beginning with a review and content analysis of relevant research, Martindale and colleagues (2010) generated their initial ideas and items in consultation with coaches, athletes and sports psychologists. Factor analysis then identified seven factors (long-term development focus, quality preparation, communication, understanding the athlete, support network, challenging and supportive environment and long-term developmental fundamentals) contributing to effective talent development environments. While the TDEQ enabled professionals with a practical yet evidence-based tool to improve their talent development programs across different sports, the measure experienced issues with conceptual overlaps between factors and low internal reliability within some of them (Li et al., 2015; Wang et al., 2011, 2016). Further validation of the TDEQ yielded a five factor model, the TDEQ-5 (long-term development, support network, holistic quality preparation, communication and alignment of expectations; Li et al., 2015; Li et al., 2018). Our review pertaining to talent development environment is therefore organized on the basis of the five factor framework and the review results are summarized in Table 1.

Table 1. Essentials of Talent Development Environment

Components	Features
Long-Term Development	- Allow mistakes - Emphasize fundaments - Reap the gains of diversification - Delay specialization - Identify late bloomers
Support Network	- Seek continual familial support - Extent support network to friends and peers - Give permission to maintain or development support network - Avoid intra-team conflict
Holistic Quality Preparation	- Employ deliberate practice - Individualize programs with sports science support - Balance training and recovery/school - Create a sporting culture
Communication	- Provide immediate informative feedback - Build positive coach-athlete relationship - Set clear performance plan that emphasizes on progression - Use both formal and informal communication channels
Alignment of Expectations	- Set expectations with appropriately difficult challenges - Align expectations with the long-term development goals - Involve significant others in adjusting expectations

Long-term Development

Champions are not born in a day. This saying, calling for an emphasis on long-term development over short-term performance, receives support by the vast majority of talent development literature (Martindale et al., 2010). Ericsson, Krampe and Tesch-Römer (1993) for instance, argue that many skills are "the result of intense practice extended for a minimum of 10 years". Similarly, Bloom's (1985) Model of Staged Development, crafted through interviews with world-class athletes and other non-sports talents, proposes a stage based model for the development of expertise over time. Individuals' transition from the stage of initiation towards development and eventually, perfection, only moving on to the next stage with the acquisition of requisite skills, mentalities and relationships.

In view of the long-term nature of the emergence of elite performance, well-designed long-term development programs are better poised to tackle issues in the talent development process. Retaining the flexibility to forgo short-term success to emphasize activities important for future development, these programs are more able to allow mistakes, emphasize fundamentals and reap the gains of diversification and delayed specialization (Johnson et al., 2006; Li et al., 2014; Martindale et al., 2010). Baker, Cobley and Fraser-Thomas (2009) noted several physical and psychosocial costs of early specialization such as increased risk of injury, slower maturation and diminished social development that more short-term focused programs may leave their athletes prone to. Furthermore, long-term programs, in prioritizing future success over immediate rewards, are more likely to be equipped to appropriately anticipate, discount and manage performance level fluctuations over one's athletic development emerging from various mental and physical impediments (Martindale et al., 2010).

The importance of long-term development as a factor of the talent development environment stresses the need for integration of talent development initiatives with their talent identification counterparts, such that potential athletes are, at the earliest possible opportunity, incorporated into a long-term system dedicated to maximizing their potential (Li et al., 2014). However, an emphasis on long-term development should also be structured to allow identification of late bloomers (Li et al., 2014). Vaeyens and colleagues (2008) argues that talent identification and talent development programs should be interconnected, considering maturity and long-term potential to avoid excluding prospective stars.

Support Network

A social support network readily available to athletes contributes to the success of the talent development environment (Li et al., 2015). Qualitative studies of top athletes and their families found that family members play an important role in supporting athletes psychologically and logistically throughout their development from amateurs to professionals (Côté, 1999; Durand-Bush, Salmela, 2002; Henriksen et al., 2010; Holt, Morley, 2004). The importance of support networks have been reinforced through quantitative approaches. Lafferty and Dorrell (2006) uncovered an association between perceived parental support and coping strategies in junior age group swimmers. Low perceived parental support was linked to self-blame and venting emotion, whereas high-perceived parental support was associated with coping through training. In a study involving tennis players, belonging, appraisal and overall social support predicted several components of tennis performance (Rees et al., 1999).

Aside from familial support, friends form another important aspect of athletes' support network (Li et al., 2014). Patrick and colleagues (1999) reported that when adolescent talents viewed talent development programs as impeding their social life, motivation and enjoyment in their talent was undermined. Thankfully, the professional sporting environment creates a fertile opportunity for friendship, and most of athletes' friends are from sporting circles (Carlson, 2011; Henriksen et al., 2010; Patrick et al., 1999). Interviews with adolescent athletes revealed that these peer relationships among athletes were important to maintaining their long-term commitment to sporting, and were often regarded as more intimate than regular friendships (Patrick et al., 1999). The shared expertise of athletes uniquely places them in a position to provide professional support to one another as friends, in addition to more conventional forms of peer support (Durand-Bush, Salmela, 2002; Henriksen et al., 2010; Li et al., 2014; Morgan, Giacobbi, 2006).

Conversely, negative social support serves as a threat in TDEs. World-class and developing athletes alike reported that parental expectations for performance fostered pressure that undermined performance (Durand-Bush, Salmela, 2002; Holt, Dunn, 2004). Other studies show that the development of a performance climate (competition for relative superiority instead of focus on skill development) and intra-team conflict (where teammates put one another down) are related to negative outcomes such as anxiety and reduced enjoyment (Keegan et al., 2010; Vazou et al., 2005).

Given the importance of a positive support network, effective talent development environments should encompass solid, contingent social support for athletes. However, talent development programs are limited in their ability to foster support networks, having to ensure conducive training environments at the same time. Interview studies show that growing athletic commitment often accompanies social sacrifices (Henriksen et al., 2010; Holt, Dunn, 2004; Holt, Morley, 2004). Furthermore, for professional programs to force social support as a contributor to professional accomplishment is an ethically problematic issue (Rees et al., 1999), and will likely detract from the growth of an organic, contingent support structure. Talent development practitioners may be confined to allowing athletes to build and maintain their own support networks, ensuring that as far as possible, talent development programs facilitate rather than impede the natural development of good social support (Rees et al., 1999).

Holistic Quality Preparation

Holistic quality preparation refers to the strength of intervention programs both within and outside the formal talent development situation (Li et al., 2015). The multidimensional nature of talent, encompassing physiological, psychological and technical aspects, suggests that effective talent development environments concentrate on more than merely technical skills and physical ability (Abbott, Collins, 2004; Li et al., 2014; Martindale et al., 2007). Successful development requires more generic skills such as sporting fundamentals, effective decision-making and life skills (Martindale et al., 2007), pointing towards a more multidimensional yet integrated approach to talent development.

The importance of a holistic approach does not detract from the core aim of athletic achievement; high quality practice is indispensable for success in professional sporting. Ericsson's theory of deliberate practice (Ericsson et al., 1993) notes several requisites for effective learning. While deliberate practice encompasses task engagement, learners also stand to benefit from an appropriate task that accounts for the existing knowledge, as well as informative feedback of their performance. Extended and repeated access to the contingent task and feedback is necessary to

improve performance. In addition to the formal coaching situation, the talent development environment is enriched by support staff members that provide specialist knowledge in the talent development process beyond the technical expertise of the coach (Durand-Bush, Salmela, 2002). Of the world-class athletes studied by Durand-Bush and Salmela (2002), many worked with more than just their head coaches. Psychologists, physiologists, nutritionists and other support staff contributed to their attainment and maintenance of success. Importantly, individualized approaches should be considered to ensure that talent development programs are tailored to the individual athlete as approaches that work for one athlete may not work for another (Carlson, 2011; Johnson et al., 2006, 2008).

Training should incorporate recovery in tandem with exertion. Aside from the obvious physical strain from high level practice, the intensity of effective training, though necessary for excellence, may lead to "staleness", "overtraining" and "burnout" (Ericsson et al., 1993). Involving physical and emotional fatigue, poorer performance and devaluation of the sport (Ericsson et al., 1993; Gustafsson et al., 2011; Raedeke, 1997), burnout may lead to withdrawal, long-term impaired performance as well as negative physiological consequences (Gustafsson et al., 2011). Successful teams often take breaks, tapering as competitions approached, differentiating them from unsuccessful teams that were typically over trained (Durand-Bush, Salmela, 2002). Well-designed talent development programs should therefore include physical rest, as well as help athletes combat psychological stress (Abbott et al., 2002; Martindale et al., 2007).

Finally, holistic quality encompasses components external to the formal talent development setting. Schools often play an important role in developing athletic talent, and the school environment can also potentially complement formal talent development programs, with many accomplished athletes still in, and enjoying, school (Durand-Bush, Salmela, 2002; Li et al., 2014; Li, Wang, Pyun, 2017a). While academic and athletic development often occur concurrently, successful athletes balance the demands of both (Côté, 1999; Durand-Bush & Salmela, 2002; Li et al., 2017a). Cultural factors also form a part of the talent development environment. The culture of a sport in a country arguably contributes to sporting success among its citizens, such as with Canada's strength in ice hockey and South American nations' prowess in soccer (Baker, Horton, 2004; Côté et al., 2006). Others also suggest that the intimacy and informality of talent development environments in smaller cities are more conducive for athletic success, given the greater satisfaction children gain from sport in these environments (Côté et al., 2006; Li et al., 2014).

Communication

Li and colleagues (2015) also identified communication, the ability of coaches to communicate effectively with the athlete formally and informally, as an important aspect of the talent development environment. This includes feedback, goal setting, development planning and emphasis on progression (Li et al., 2015; Martindale et al., 2010). The importance of the coach-athlete relationship has been highlighted by many (Baker, Horton, 2004; Bloom, 1985; Carlson, 2011; Côté et al., 2006; Durand-Bush, Salmela, 2002; Gould et al., 2002; Li et al., 2014; Martindale et al., 2007; Morgan, Giacobbi, 2006), seeming to suggest that a mix of formal, high level coaching, emotional support and tangible help are important towards coaching success (Morgan, Giacobbi, 2006).

A survey involving all athletes who participated in the 1996 Summer and 1998 Winter Olympics (Gould et al., 2002) found that many formal and informal aspects of coaching affected performance. In formal coaching, immediate informative feedback followed by repeated performance of the task is a key aspect of deliberate practice (Ericsson et al., 1993). Yet, successful coaching involves more nuance than mere informational support. In the formal coaching situation, Gould and colleagues (2002) found that over-coaching, an inability to deal with crises, make fair decisions and communicate effectively were all believed by Olympic athletes to negatively impact their ability to varying degrees. On the other hand, a clear performance plan implemented by the coach bolstered performance.

Martindale and colleagues (2007) argues that the informal facet of the coach-athlete relationship is a "vital extra" to the formal coaching situation. Relaxed meetings between coaches and athletes build trust and rapport, while providing an avenue for important informational exchange that may help to augment coaching quality and athletic performance (Martindale et al., 2007). The importance of the coach-athlete relationship is understandable, given the non-linear

pathway to world-class achievement and its consequent implications on the effectiveness of a talent development environment (see holistic quality preparation). Athletes surveyed in Gould and colleagues' (2002) study of 1996 and 1998 Olympians indicated that trust in their coach's ability and commitment to their success aided their performance, showing how trust built in informal settings contributes to athletic success. While informal settings may build athletes' trust in coaches' ability, they may also allow coaches to understand athletes better. Athletes who felt that their coaches did not know them or were attuned to their needs also believed that this had a negative impact on their performance (Gould et al., 2002). This included coaches' expectations of athletic performance; athletes believed that coaches' unrealistic expectations hurt their performance.

Alignment of Expectations

Referring to how targets are set and aligned in talent development programs (Li et al., 2015), alignment of expectations is highly related to the other factors. As noted, a good coach-athlete relationship encompasses realistic expectations of performance (Gould et al., 2002). This carries implications on the tailoring of an individualized training program well suited to the athlete (Carlson, 2011; Johnson et al., 2008, 2006), an important aspect of a quality talent development environment. Within individual coaching encounters for instance, well set expectations facilitate the development of appropriately difficult challenges that allow deliberate practice and subsequent learning (Ericsson et al., 1993). The continued utility of deliberate practice also involves the appropriate adjustment of expectations based on achievement, in order to ensure continued contingency of challenges.

In a talent development program focused on long-term development, athletes' expectations likely also need to be adjusted to align with the program's emphasis on a long-term benchmark; individuals unable to work towards long-term goals are often those who fail to perform or dropout (Abbott, Collins, 2004). Given the importance of athletes' self-motivation to the survival and success of a long-term program, athletes should be involved in decisions regarding their development and availability of opportunities (Martindale et al., 2010). This can be achieved with the aid of parents, sport psychologists and other support staff. The relationships between the different factors, despite their individual importance, stress the importance of an integrated yet multi-factorial approach to understanding talent development environments.

Towards a Theoretical Basis for the Talent Development Environment

Indeed, all components of talent development interact with each other in manners unique to the individual (Gagné, 2010). The ability of the talent development environment to effect changes on psychological factors of talent development forms a component of the operation and effectiveness of talent development programs (Li et al., 2017b; Wang et al., 2011, 2016). This section attempts to present an understanding of the influence of talent development environments on athletic performance through theoretical frameworks. Forming a theoretical understanding of the influence of environmental factors on athletic success may guide the structuring of future interventions aimed at cultivating athletic achievement. To date, self-determination theory (Deci, Ryan, 1985, 2000; Ryan, Deci, 2000) and achievement goal theory (Dweck, Leggett, 1988; Dweck, 1986; Elliott, Dweck, 1988; Nicholls, 1984) are the two theoretical frameworks that have been used to understand the impact of talent development environments on athletes' outcomes in particular to their motivation.

Achievement Goal Theory

One approach that has received particular attention in the literature on motivation is achievement goal theory (see Elliot, 2005 for review), which has seen application in the talent development literature (Wang et al., 2011, 2016). Dweck and colleagues (Dweck, Leggett, 1988; Dweck, 1986; Elliott, Dweck, 1988) first formulated this theory with reference to a central distinction between learning and performance goals. As individual competence goals, learning goals related to increasing task competence, while performance goals concerned the seeking of favorable judgements of competence (Dweck, Leggett, 1988). This approach was conceptually similar to those developed by others at the time (Ames, Archer, 1988; Elliot, 2005), such as Nicholls (1984), who referred to a distinction between task and ego involvement, and Ames and Archer (1987, 1988), who distinguished between mastery and performance goals.

Early formulations of achievement goal theory drew a relationship between implicit theories of intelligence, achievement goals and behavioral tendencies (Dweck, Leggett, 1988; Elliott, Dweck, 1988). Based on her research with school children (Diener, Dweck, 1978, 1980), Dweck sought to

explain why differences emerged among some children, classified as "helpless", and others, referred to as "mastery-oriented". Despite similarities in performance prior to failure, "mastery-oriented" children sought challenges and persisted through failure, finding solutions to overcome them. Children characterized by the "helpless" pattern avoided challenging situations and gave up easily, attributing failure to lack of ability (Diener, Dweck, 1978, 1980; Dweck, 1986). By fostering learning and performance goals experimentally, Elliot and Dweck (1988) found that those with performance goals tended to respond in a helpless manner, while those with learning goals were inclined to respond in a mastery-oriented fashion. Tendency to adopt performance or learning goals were also found to be dependent on individuals' implicit theories of intelligence; those who held an entity theory (that intelligence is a fixed trait) tended to adopt performance goals, while those believing in an incremental theory of intelligence (that intelligence is malleable) were more likely to adopt learning goals (Dweck, Leggett, 1988).

Elliot (1999) later proposed adding an approach-avoidance (valence) dimension to the achievement goal approach, arguing that this framework better accounted for existing findings within the achievement goal literature. This eventually led to a formulation involving four achievement goals: mastery-approach (focused on task-based competence), mastery-avoidance (focused on task-based incompetence), performance-approach (focused on normative competence) and performance-avoidance (focused on normative incompetence). In particular, the addition of a valence dimension addressed issues of mixed results, where performance goals were tied to adaptive rather than maladaptive behavior (Elliot, 1999). Despite the addition of more goals, Elliot (1999) suggested that multiple goals could be pursued simultaneously. Within the sporting context and other areas, this 2×2 framework was later supported by confirmatory factor analyses (Elliot, 2005; Wang et al., 2007). Empirical research using Elliot's 2×2 framework found that in general, widespread positive effects were associated with mastery-approach goals, while performance-approach goals were linked to positive but truncated effects (Elliot, 2005). Most of the negative effects of performance goals uncovered in earlier literature were associated with performance-avoidance goals, highlighting the importance of the valence dimension (Elliot, 2005).

Self-Determination Theory

As the predominant approach to understanding achievement motivation (Elliot, 2005), achievement goal theory remains a useful construct in understanding the influence of talent development environment on athletic achievement through its impact on athletes' psyche. However, such an analysis may be insufficient. Self-determination theory (Deci, Ryan, 1985, 2000; Ryan, Deci, 2000) presents a more holistic approach, in which perceived *competence*, central to achievement goal theory, is but one of three basic psychological needs integral to self-determination of behavior alongside *autonomy* (referring to the experience of choice) and *relatedness* (a sense of connectedness to those concerned with the goal).

Various studies have shown that generally, greater satisfaction of these three needs has led to greater intrinsic motivation, where actions are performed due to their inherent draw, as opposed to extrinsic motivation, where actions are performed in view of outcomes separate from the activity (Deci, Ryan, 2000; Ryan, Deci, 2000). In these studies, intrinsic motivation was usually measured through questionnaire measures or a "free choice period" where subjects are given the freedom to engage with or ignore a target task (see Deci, Ryan, 1985 for review). Intrinsic motivation is better understood in view of the *locus of causality*, another concept important to self-determination theory (Ryan, Connell, 1989). Derived as a simplex model, perceptions of an action's locus of causality can range from an *external locus of causality*, where an action is performed entirely for reasons external to the self, to an *internal locus of causality*, where it is performed for reasons inherent to the self (Ryan, Connell, 1989). Where intrinsically motivated behaviors carry an internal locus of causality, extrinsically motivated behaviors have a more external locus of causality (Ryan, Deci, 2000). In terms of motivating desired behaviors, intrinsic motivation is favored due to its ability, by definition, to regulate and motivate desired behaviors without the need for external influences, inspiring high quality learning (Deci, Ryan, 1985; Ryan, Deci, 2000). A third motivational state, *amotivation*, describes an unregulated activity that one consequently has no motivation to pursue (Deci, Ryan, 1985).

Relation between Constructs

Due to achievement goal theory's concern with conceptions of competence, some proposed that elements of the talent development environment could predict athletes' achievement goals.

This was investigated by Wang and colleagues (Wang et al., 2011) in a questionnaire study involving 374 athletes in a Singaporean sports school. Using the TDEQ and the Achievement Goal in Sport Questionnaire, the investigators found that the TDEQ measures accounted for 10-27 % of the variance in the four achievement goals. Notably, long-term developmental focus, long-term developmental fundamentals (both largely condensed to long-term development in the TDEQ-5), support network and communication predicted the adoption of mastery-approach goals. Long-term developmental focus and fundamentals also positively predicted the adoption of performance-approach and performance-avoidance goals.

A further study involving Korean and Singaporean adolescent athletes (Wang et al., 2016) suggested that perceived competence moderates the relationship between the TDE and achievement goal adoption. For instance, long-term development focus predicted mastery-avoidance in those with low perceived competence, though failing to predict it in high perceived competence individuals. Also, those higher in competence reported higher goal adoption regardless of valence. These findings suggest that the talent development environment is important towards encouraging positive achievement goal formation that may lead to adaptive, mastery-oriented training behavior (Wang et al., 2011). In particular then, successful talent development programs should foster an environment that eventually promotes mastery-oriented behavior and emphasizes long-term development with assistance of other talent development environmental factors such as communication, support network and holistic quality preparation (Wang et al., 2016).

Studies involving self-determination theory have also highlighted the need to consider the talent development in athletic motivation. In addition to investigating the talent development environment's relationship with achievement goal constructs, Wang and colleagues' (2011) also sought to understand links between the talent development environment and motivational styles. The relationships between the talent development environment (long-term development and fundamentals, support network) and athletes' motivation reflect one mechanism through which the talent development environment influences athletic success. This emphasizes the need to consider the talent development environment in continuing to promote intrinsic goals where possible and developing a successful talent development program, especially given the link between intrinsic goal pursuit and mastery-approach goals that are associated with positive outcomes. Later studies investigating athlete burnout further supported an association between the talent development and the satisfaction of the three basic psychological needs, while providing evidence that athletic burnout was negatively related to needs satisfaction (Li et al., 2017a, 2017b).

Limitations and Future Research Directions

The research reviewed thus far has supported the importance of considering the talent development environment in fostering athletic success, provided an understanding of its constituent elements and presented a preliminary theoretical understanding of one way the talent development environment influences athletic achievement. However, issues in existing research and gaps in the literature provide room for further study. Given the relatively recent development of the TDEQ-5 (Li et al., 2015), many studies investigating the talent development environment have used the TDEQ, providing a less than ideal measure of the talent development environmental factors. The *challenging and supportive environment* factor in the TDEQ has been plagued by poor internal reliability (Li et al., 2015; Wang et al., 2011, 2016). A revised TDEQ developed by Wang and colleagues (2011) removing this factor was similarly flawed; it was tested in only one sample and yielded low internal reliability ($\alpha = .62$) in *quality preparation* (Li et al., 2015). Several factors of the original TDEQ also face problems of conceptual overlap. Where supportive environment and support network both concern support external to the formal coaching situation, *long-term development focus* and *long-term development fundamentals* both emphasize long-term development (Li et al., 2015). Given issues with the TDEQ, more studies should be conducted using the refined TDEQ-5 to validate and extend the existing literature. The TDEQ-5 also requires further work; developed based on results from Singaporean schools and Chinese sports institutions, cross-cultural replication is required to ensure the generalizability of the scale (Li et al., 2015, 2018). The ecological validity of the TDEQ-5 may also have been threatened by the removal of some items from the original TDEQ, prompting the need for further refinement of the TDEQ-5 (Li et al., 2015).

Another issue with the TDEQ and the TDEQ-5 is their role as generic scales evaluating talent development environments (Li et al., 2015; Martindale et al., 2010; Wang et al., 2011). On one hand, studies are required to confirm the invariance of the measures across different sports (Wang

et al., 2011). On another, their generic nature ignores context-specific requirements of a given talent development situation (Martindale et al., 2010). This is particularly important given the uniqueness of each sport that increasingly dominates later stages of professional athletic development (Abbott et al., 2002; Abbott, Collins, 2004; Côté, 1999). Through interviews with 15 athletes and their families, Coté (1999) found that as athletes progressed, they dedicated decreasing amounts of time to extraneous activities, channeling more time towards a few sports, and eventually a single sport. Abbott and Collins (2004) similarly noted that while transferrable elements dominated early sporting development, sport-specific factors gained greater importance in later stages. The importance of considering sport-specific elements in understanding the talent development environment has been acknowledged by Martindale and colleagues (2010), who in developing the TDEQ called for exploration of these issues in view of potential extensions of context-specific instruments from the generic TDEQ. Durand-Bush and Salmela (2002) likewise indicated the need for more sport-specific research in the role of support networks in athletic development.

Many earlier studies investigating the talent development environment have also relied heavily on qualitative approaches involving athletes, their families and sporting professionals. Though useful for exploratory understandings of the talent development environment, quantitative research is required for a more rigorous conception of the elements and influence of talent development environment on athletic accomplishment. Where quantitative research has been employed, most did not track the influence of the talent development environment on sporting development, or relied on cross-sectional approaches, hampering ability to draw causal inferences. Recent papers have acknowledged this issue, calling for longitudinal and experimental studies that lend themselves to causal analyses (Li et al., 2017b). Finally, while theoretical approaches such as achievement goal theory and self-determination theory have proven useful lenses to understanding the influence of the talent development environment on athletes and their development, more work is required to improve academic understanding of the influence of talent development environments on athletic success, as well as to refine theoretical perspectives to account for domain-specific elements.

3. Conclusion

This review provided a contemporary understanding of the environment's elements, as well as their differential and holistic role in fostering talent development. Its approach made particular reference to the factors identified in the development of the TDEQ-5, namely *long-term development*, *holistic quality preparation*, *support network*, *communication*, and *alignment of expectations* (Li et al., 2015). The influence of talent development environment on athletic success was also explored through the lens of psychological motivation with appeal to key theoretical perspectives: achievement goal theory (Dweck, Leggett, 1988; Elliot, 1999, 2005; Nicholls, 1984) and self-determination theory (Deci, Ryan, 1985, 2000; Ryan, Deci, 2000). This was performed with the aim of understanding the operation of the talent development environment as a mechanism towards talent development on the intrapersonal level that could inform future development and refining of talent development processes. Work involving these theories provided evidence that constituent components of the talent development environment, achievement goal orientations and basic psychological needs are related concepts.

Despite the growing literature aimed at understanding the talent development environment, this area may still benefit from further research. Ultimately, academic understanding of talent development needs to be channeled towards professional practice in both powerhouses and ascendant nations, among world champions and underdogs alike. Maintaining the privilege of witnessing "Faster, Higher, Stronger" feats of human ability year on year is contingent on amassing greater knowledge of what underpins human excellence, and how to put that knowledge to work.

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