

Early Specialization or Early Athletic Competencies? Literature Update and Methodological Considerations

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Abstract

The early sport specialization is characterized as intensive year-round training and/or competition, involving participation in a single sport that typically begins in the prepubertal years. In recent years, most of the major national societies and international sports and athletic associations, federations, and organizations have released position statements advising against the practice of early specialization amongst youth sports. Youth sports training must necessarily take into account the cultural and social factors of each country. Over the last decades, several development models have been structured, integrated, and implemented, predominantly focusing upon the idea of the sporting talent model and framework. The practitioners emphasised the importance of variety and participation in a large range of sports and activities. This was identified as fundamental and a *key* aspect of long-term athletic development for developing *well-rounded athletes* whilst reducing burnout in one sport. This study describes the change in the methodological paradigm in the youth sports training model by analyzing the most recent literature; it aims to describe the methodological orientation that must distinguish long-term training from the risk of early specialization.

Keywords

Early Specialization, Long-Term Athletic Development, Health, Youth Sport

1. Introduction

The early sport specialization is a feature that characterizes youth sports practice.

The early sport specialization is characterized as intensive year-round (>8

months per year) training and/or competition, involving participation in a single sport that typically begins in the prepubertal years (LaPrade et al., 2016; Mosher et al., 2020; Moeskops et al., 2022). Early specializing young athletes can be exposed to intensive training schedules with high volumes and frequencies; this chronic exposure to the same sporting skills may limit diversified skill acquisition and reduce long-term participation in sports (Mosher et al., 2020; Moeskops et al., 2022). Notably, these athletes often accumulate weekly training hours which surpass the recommendations of not exceeding the child's chronological age in years (Brink et al., 2014; LaPrade et al., 2016; Root et al., 2019; Moeskops et al., 2022).

The hypothesis that earlier specialization increases the likelihood of eventually achieving elite sport performance mainly comes from research using the “*deliberate practice framework*” (Ericsson et al., 1993). As the name suggests, this framework emphasizes the time spent in training and proposes a monotonic relationship between hours spent engaging in effortful, domain-specific (i.e. sport-specific) “*deliberate practice*” and performance (Mosher et al., 2022; Gabbett, 2022).

The study that clarifies the terms of the question and analyzes the topic according to the most significant scientific evidence is an interesting review of 2020 (Mosher et al., 2020): before this analysis, the discussion in this area is driven by non-data-driven, commentaries, editorials, and reviews, which undermines the extent to which recommendations about early specialization can be seen as evidence-based.

In fact, this review underlines how only 37% of the literature included data-driven studies that were explicitly designed to advance our understanding of early specialization specifically, with 43% of the papers comprised of editorials, commentaries, or reviews (Mosher et al., 2020).

This study aims to analyze the concept of early specialization, integrate some methodological reflections and suggest a model that can ensure a competitive experience for young athletes while protecting their health.

2. Specialization: Types and Levels

The sports specialization can be classified and distinguished on the basis of certain scales of determination.

An interesting review described the tools used and some limitations in the use of these measurement tools (Mosher et al., 2020).

The most commonly used scale is Sport Specialization Scale, which uses three criteria (Jayanthi et al., 2015): 1) single sport training, 2) exclusion of other sports, and 3) year-round training (>8 months) to rank athletes as low (having only one of the criteria), moderate (two of three) or high on specialization (all three). Over 30% of the data-driven specialization-specific studies in a recent review used this scale, despite concerns about the validity of this scale (Smith et al., 2017). For example, with this scale, a recreational athlete who participates once a week for 2 h in basketball, but quit soccer at age seven, would be regarded as

more specialized than a competitive basketball player who participates for 6 h a week but only ever participated in basketball, despite the fact that most practitioners would be more concerned about the latter. Furthermore, 20% of studies in the cited review used only a single item to measure specialization, raising further concerns about whether a single item is nuanced enough to adequately capture this multi-faceted concept (Mosher et al., 2020). According to this review, 18 different approaches have been used to determine specialization status often inconsistently categorizing athletes (Mosher et al., 2020). For instance, one study compared a self-classification method (i.e. are you a single sport or multi-sport athlete) to the 3-point *Sport Specialization Scale*, resulting in only 38% agreement on the athletes' categorization and differing results on the relationships between specialization status and injury history (Bell et al., 2016).

The specialization average age and percentage of athletes who specialized varied considerably across the different sports. In fact, 73% gymnasts and 54% figure skaters specialized at the youngest age (age range 8 - 10 years), whereas 86% of hockey players specialized on average at 12.5 years of age (Martin et al., 2017; Moeskops et al., 2022). To these data it should be added that recent literature reviews have investigated the impact of early specialization on career and task-specific athletic performance and concluded that sport specialization was not a prerequisite for success at more elite levels (Kliethermes et al., 2020; Rees et al., 2016; LaPrade et al., 2016). In recent years, most of the major national societies and international sport and athletic associations, national federations, and organizations have released position statements advising against the practice of early specialization amongst youth sport (e.g. American Orthopedic Society for Sports Medicine, American Academy of Pediatrics, International Society of Sport Psychology, National Association for Sports and Physical Education). When the official positions of so many associations are in agreement, everyone is really faced with a phenomenon that is dangerous for the young athlete health that must be hindered in every context (Mosher et al., 2020). Therefore, there is emergent consensus among researchers and practitioners opposing an early specialization approach, owing to the associated potential negative effects on children and adolescents' physical and psychosocial wellbeing (Moeskops et al., 2022; Mosher et al., 2020; Raiola, 2017; Faigenbaum et al., 2016; Myer et al., 2016; Lloyd et al., 2016; Mostafavifar et al., 2013).

3. Can Coexist the Health and Performance in Youth Training?

When designing training plans to enhance performance conducting a thorough need analysis of the sport's demands (physiological and biomechanical) and types of activities, the early specializing athlete will be frequently exposed to is important (Feeley et al., 2016; Wilhelm et al., 2017; Iona et al., 2022).

Technical staff should consider injury epidemiology within the sport to identify common overuse injury sites, areas prone to strength and mobility deficien-

cies, postural issues, and limb asymmetries (Sannicandro et al., 2014; Sannicandro & Raiola, 2021a, 2021b, 2022; Gonzalo-Skok et al., 2022). The literature highlight that an overuse injuries can be prevalent in early specializing athletes (Jayanthi et al., 2019, 2020), and the practitioners should implement practice that includes a large amount of movement variability, to provide exposure to a variety of movement patterns to vary the force application and coordination demands (Varghese et al., 2022).

Furthermore, if growth-related injuries are prevalent in the sport, practitioners should also be aware of the underpinning mechanisms and the signs and symptoms associated with these injuries (Dicesare et al., 2019).

Based on literature data, athletes who trained for their sport more hours per week than their chronological age had a greater risk of serious overuse injuries than those training fewer hours than their age (odds ratio, 2.07) on multivariate analysis (Jayanthi et al., 2019, 2020).

In fact, it is recommended to limiting weekly training hours to fewer than the athlete's age to reduce the injury risk (Jayanthi et al., 2019, 2020).

Add to these data that a sports training ratio (weekly hours in organized sports/ weekly hours in free play) was calculated based on reported weekly training hours to provide another clinical tool regarding the training risk and type of physical activity. In the literature it is recommended that this ratio not exceed 2:1, as the odd ratio of serious overuse injuries was 1.87 on multivariate analysis (Jayanthi et al., 2015).

The relationship between load monitoring, diversification of motor tasks/ methods, and the risk of injury is very significant.

A key role for practitioners working with early specializing athletes is to assist with monitoring of internal and external training loads, as well as using screening tools for indicators of overtraining (poor quality of night sleep, fatigue, reduced performance etc.) and burnout (Whatman et al., 2021; Myer et al., 2016).

The specific literature have monitored training loads over 41 weeks in young athletes from various sports and reported intensity during the week before injury was significantly higher compared with that of the preceding 4 weeks (Malisoux et al., 2013). The training load “*spikes*” role on injury risk in youth was evaluated in a 2-year study in male youth cricketers monitored acute and chronic workloads of bowling sessions and found that “*spikes*” in workloads were associated with increased injury risk (Warren et al., 2018).

Specifically, an increase in acute and chronic workloads of more than 2 standard deviations resulted in a 4 - 5 fold increase in injury risk in the subsequent 4 weeks (Moeskops et al., 2022).

The data from this study can be useful to guide the planning of training workloads around different seasons and competition demands to ensure sufficient chronic workloads are maintained, while minimizing spikes in workload (Moeskops et al., 2022).

However, it must be considered that this is likely to be more challenging in

certain sports than others; nevertheless, with such an approach, acute and chronic training loads could be managed more carefully. Indeed, the organization and monitoring of weekly training loads is a complex process and can be challenging owing to individual fluctuations in overall training loads; it is the case of the complexity of load management with school physical education, recreational activity, competition loads, etc. as well as the heterogeneity with which each one adapts and responds to workloads (Nobari et al., 2021; Scantlebury et al., 2020; Schweltnus et al., 2016; Esposito & Raiola, 2020).

The control of the load must also be associated with a modulation of the teaching styles (Colella & D'Arando, 2021; Invernizzi et al., 2022; Sannicandro & Raiola, 2022) which have a direct relationship with the volume and intensity of the load.

4. Discussion: Is It Possible to Think of Alternative Models in Youth Sports Training?

The youth sports training must necessarily take into account the cultural and social factors of each country: for example, the Italian model of youth training cannot be the same as the Swiss or French model.

The absence in Italy of specialized physical education teaching in the early years of schooling of children (3 - 11 years) must be considered an element that strongly conditions the identification and structuring of the youth sports training model.

Similarly, countries that have provided a significant volume of physical education hours in the 3 - 11 age brackets will have to think of a completely different model.

However, it is possible to identify methodological and didactic indications that can help guide the training of the young athletes.

Over the last decades, several development models have been structured, integrated and implemented, predominantly focusing upon the idea of sporting talent model and framework: Long-Term Athlete Development, LTAD, Developmental Model of Sports Participation, DMSP, Foundations, Talent, Elite and Mastery, FTEM (Varghese et al., 2022; Till & Baker, 2020; Balyi & Hamilton, 2004; Cotè & Vierimaa, 2014; Gulbin et al., 2013). In fact recent position statements and consensus have questioned the idea that these models should be limited to talented young sportsmen only, especially considering the large number of youth who experience recreational and competitive sport compared to elite sport and the requirement to extend the concept of health, fitness and physical activity for all youth (Till & Baker, 2020; Bergeron et al., 2015; Lloyd et al., 2015, 2016).

The concept of long-term athletic development was defined as the “*habitual development of athleticism over time to improve health and fitness, enhance physical performance, reduce the relative risk of injury, and develop the confidence and competence of all youth*” (Lloyd et al., 2016). The NSCA position statement

aimed to help foster a more unified and holistic approach to long-term athletic development, to promote the benefits of a lifetime of healthy physical activity, and to prevent and/or minimize sport and physical activity-related injuries.

The idea of plans providing a variety of opportunities was identified as vital for long-term athletic development. The sub themes related to multi-sport and multi-activity, movement development, physical development, task individualization and education are repeatedly referred in the LTAD (Varghese et al., 2022).

Practitioners emphasised the importance of “*variety*” and participation in a “*large range of sports and activities*” (Sannicandro & Raiola, 2021a, 2021b; Varghese et al., 2022). This was identified as fundamental and a “*key*” aspect of long-term athletic development for growing “well rounded athletes” whilst reducing the burnout in one sport (Lloyd et al., 2015, 2016; Varghese et al., 2022).

The literature helps this analysis because it indicates LTAD as a model capable of reducing drop out and guaranteeing a sports experience that protects the young athlete health (Lloyd et al., 2016; De Borja et al., 2022; Moeskops et al., 2022; Jayanthi et al., 2022).

However, the concept of LTAD must be declined and calibrated in order to provide guidelines for technical staff: this clarification is necessary when considering the declining trends in physical fitness (Sandercock & Cohen, 2019), physical activity (Colella & D'Arando, 2021; Invernizzi et al., 2022; Tremblay et al., 2016) and motor skill development (Lawson et al., 2021; Bolger et al., 2019), alongside increased overweight and obesity prevalence (Gensthaler et al., 2022; Ogden et al., 2016) within youth populations.

The LTAD structure and idea also makes it possible to ensure a further qualitative parameter to the young athlete sporting experience: the opportunity of presenting various and diversified motor experiences that can form the basis for transferable learning (Sannicandro & Raiola, 2022; Williams et al., 2021; Moran et al., 2018; Granacher et al., 2016).

The diversification of motor tasks with the support of various external resistances and different surfaces (elastic bands, weight balls, dumbbells, partners, unstable tools, perturbation tools, climbs, sand, etc.) allows you to increase muscle strength and encourage ever new coordinative adaptations.

The literature suggests that not only the practice volumes but above all the diversification of motor experiences can lead to an increase in efficiency and performance (Sannicandro & Raiola, 2021a; Varghese et al., 2022; Barth & Güllich, 2021; D'Isanto et al., 2021; Fischetti et al., 2019; Raiola & Altavilla, 2020; Invernizzi et al., 2022). Research on athletics practitioners has identified 4 elements that contribute to the increase in performance at a young age: 1) coach-led multi-sport practice in childhood/adolescence was a critical discriminator of the efficiency of adult practice and performance improvement; 2) The associations are not linear; 3) The likelihood of achieving high practical efficiency was greater when combining ~1000 - 2500 hours of athletics practice up to the age of 19 with ~1250 hours of practicing other sports up to the age of 19; 4) Peer-led activity in

any sport has had negligible effects (Barth & Güllich, 2021).

The proposals deriving from the LTAD allow diversifying the motor experiences and satisfying the qualitative criteria described in the literature.

The LTAD proposals, therefore, can remedy any lack of diversified motor activities or the impossibility of practicing different sports.

5. Conclusion

In this context, LTAD tasks serve as an umbrella term for an array of these training interventions, incorporated within a plan of athletic development that includes exercises targeting muscular strength, mobility, balance, and impulsive movement (Williams et al., 2021; Filipa et al., 2010). Accordingly, enhancing athletic foundations in young athletes, and presenting a diversity of physical demands to the neuromuscular system are also considered important means of mitigating the risk of injury (Williams et al., 2021).

A key idea of LTAD programs is to improve movement competency. In light of this, the LTAD tasks can be considered important to the development of fundamental movement skills that are broadly defined as movement patterns that involve two or more body segments and commonly promoted in models of youth athletic development (Sannicandro & Raiola, 2021b; Liefieith et al., 2018; Morgan et al., 2013). Typically utilized in athletic settings, these fundamental movements have been assessed against criteria for desirable technical execution that are thought to be an indication of movement quality and proficiency (Williams et al., 2021; Morgan et al., 2013).

Alongside the methodological guidelines, a broader policy of monitoring the indicators that reveal the sport experience quality of young people must be promoted and implemented.

Levels of load exposure, training frequency, teaching styles, and quality of the methods implemented, maybe some of the determinants of a sports experience that is attentive to health and not only to performance.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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