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A Coaching Session Framework to Facilitate Long-Term Athletic Development

Keywords: LTAD, coaching, youth, holistic, strength & conditioning, fitness

Abstract

The implementation of long-term athletic development (LTAD) aims to improve health, physical activity and performance of all youth. Contemporary LTAD models suggest that a broad range of physical and psycho-social competencies should be developed in youth, but few resources are available for coaches that describe 'how' to achieve these outcomes. This paper overviews a coaching session framework called RAMPAGE (**R**aise, **A**ctivate, **M**obilise, **P**repare, **A**ctivity, **G**ames, **E**valuate). The framework provides practitioners with information on *what* can be planned and delivered and *when* within a coaching session, across multiple ages and stages of development within multiple contexts (e.g., physical education, talent development).

Introduction

Youth sport pathways can have wide ranging goals, from increasing participation within sport for health, fitness and physical activity outcomes (41) to creating the sporting superstars of tomorrow within talent development and elite sport systems (61). Numerous development models (e.g., the Long-term Athlete Development model (4), the Developmental Model of Sports Participation (10), the Youth Physical Development Model (38)) have been published to facilitate these pathways and outcomes. Recently, these development models have been critiqued (18, 23, 40) highlighting the partial focus or subset perspectives (i.e., only physical or psychological) of participant and performer development that they offer. However, evidence (e.g., (3, 53)) has demonstrated the multi-disciplinary nature of human development for both sports participation and talent development resulting in recent development models (e.g., Composite Youth Development model (40)) that aim to encompass the holistic (i.e., physical, psycho-social, technical and tactical) and long-term development of youth.

An example of this increased focus on holistic development is the concept of *athleticism* (Figure 1). It is well established that developing athleticism is important for health, physical activity, sporting performance and injury risk reduction (5, 37). Athleticism has been defined as '*the ability to repeatedly perform a range of movements with precision and confidence in a variety of environments, which require competent levels of motor skills, strength, power, speed, agility, balance, co-ordination and endurance*' ((37) p. 1491). This definition demonstrates the multi-disciplinary nature of athleticism that encapsulates both health- and skill-related physical fitness (e.g., strength, speed, endurance, motor skill) alongside psycho-social factors (e.g., confidence). Similarly, most development models (e.g., (4, 38, 40)) advocate for the development of *physical literacy*. Physical literacy is defined as the motivation, confidence, physical competence, knowledge, and understanding to value and take responsibility for engagement in physical activities for life (64). Physical literacy encompasses physical capacities embedded in perception, experience, memory, anticipation and decision making (67). With this view, holistic participant development requires the development of physical, technical, tactical and psycho-social skillsets. The emergent understanding that long-term athletic development (LTAD) is vital not only for elite young athletes in talent development programs, but for all youth to ensure lifelong participation in sport and physical activity (16, 40), has led to increased awareness of LTAD principles within the fields of youth sport, sport science, strength and conditioning, and coaching (5, 18, 20, 37).

Insert Figure 1 near here

Despite this increased understanding, recent research evidence has shown declining fitness (8, 59) and physical activity levels (63), alongside an increased obesity prevalence (49) amongst youth populations. Furthermore, young athletes (~15 years) within talent development programmes have demonstrated reduced levels of motor skill (32, 68). In addition, overuse injuries, which can be a result of early sports specialization, excessive

load, under recovery, and/or physical under-development, are also a major issue within youth sport populations (6). These trends suggest that although LTAD programs have been broadly promoted across both performance sport pathways, and community and educational sectors focussed upon health and fitness, the implementation may be ineffective. Lloyd and colleagues (41) highlighted several barriers that limit the LTAD of today's youth, including physical inactivity, early sport specialisation and the organisation of youth sport. To overcome these barriers, numerous recommendations (5, 16, 41) have been suggested that include: 1) promoting the value of both health- and skill-related components of physical fitness; 2) increasing the implementation of general physical preparatory conditioning alongside sport specific practices and competition; 3) making use of integrative neuromuscular training within sports participation; and 4) implementing athletic development strategies across the entire sports season and throughout the entire year instead of only at certain time points (i.e. pre-season).

One of the challenges inherent in implementing these recommendations is that developmental level youth sport training is often delivered by sports coaches or physical education teachers. It could be argued that these coaches or teachers may have appropriate technical and tactical sports knowledge but lack a depth of knowledge in aspects such as integrated neuromuscular training. However, such coaches are expected to develop holistic LTAD without the support from a specialist strength and conditioning coach. Similarly support from sport psychologists is generally absent and coaches may feel 'out of their depth' delivering this type of content. Integrating these aspects of LTAD into a developmental sports program requires detailed planning to ensure effective implementation across a broad range of youth sport environments. While athlete development models aimed at supporting a range of practitioners in implementing LTAD programmes exist (4, 10, 38, 40), these often only provide general guidelines as opposed to specific, detailed blueprints for coaches/teachers to follow in practice. For example, the context of a programme (e.g., participation or talent environment) may influence the time and resource available to participants, therefore potentially failing to satisfy the recommendations of such development models. Beyond the theoretical concepts, it is important to consider *how* LTAD can be operationalised within regular youth sport and physical activity programs rather than being viewed as a standalone entity. To the authors knowledge, no framework has been published that focuses upon the operationalisation of holistic LTAD programmes.

Research demonstrates that providing coaches with evidence-based warm up programs has been a successful method of encouraging integrated neuromuscular training for groups including female youth soccer players (69), high school curricula (51) and youth athletes (19). Two popular integrated neuromuscular training warm up protocols in youth sport include the FIFA 11+ for kids (<https://www.fifamedicinediploma.com/lessons/prevention-fifa-11/>, (56, 57)) and the Rugby Football Union Activate programme (<https://www.englandrugby.com/rugbysafe/activate/>, (29, 30)), which implement small doses of neuromuscular training and have been shown to be effective for reducing injury

and developing physical performance (52). Although integrated neuromuscular training warm up interventions have been shown to be effective, challenges and limitations do still exist. For example, these programmes are often perceived as rigid and repetitive resulting in compliance problems (13, 48). Providing coaches with degrees of freedom to choose activities within an overall framework rather than prescriptive and restrictive programs is likely to encourage ongoing engagement with the intervention (60). These factors highlight the challenge of translating, disseminating and implementing scientific principles and research into practice within the field (14, 15, 17). Such findings also emphasise the complexity of the implementation of LTAD programmes for holistic development that combines physical development with psycho-social, technical and tactical development as a vital aspect of LTAD (e.g., (1, 9, 22, 31)).

To overcome these challenges, the aim of this article is to present a coaching session framework that was derived from evidence-based principles but could be practically applied across multiple coaching contexts. In this case, the authors have designed and developed the coaching session framework aimed at optimizing LTAD that 1) can be applied across multiple youth levels (i.e., physically inactive to sports performers) and multiple sports (e.g., team to individual), 2) can be applied across all stages of development, 3) considers the integration of physical development with other aspects of youth athletic development (i.e., technical, tactical and psycho-social development), and 4) considers 'how' coaches may implement this for LTAD purposes. The framework aims to provide a generalized structure for practitioners (e.g., sports coaches, teachers, S&C coaches) to implement a coaching session whilst allowing them to customise sessions to make them appropriate for their coaching context, their participants and the goals of their programme. Based upon this justification, the "RAMPAGE" coaching session framework is proposed that allows flexibility, variety and coach autonomy, while providing guidance for coaches on *which* activities can be delivered in-line with considerations for the athlete's stage of development and *when* during a session they can be delivered. The RAMPAGE coaching framework adapts and builds upon the popular RAMP warm up protocol (33, 34) and the acronym stands for **R**aise, **A**ctivate, **M**obilise, **P**repare, **A**ctivity, **G**ames, **E**valuate.

RAMPAGE: A Coaching Session Framework

The RAMPAGE coaching session framework is presented in Figure 2 alongside the aim, description and the targeted physical qualities within each session part. The following sections of the paper describe each part of a RAMPAGE session with a further focus upon *which* activities can be delivered at each part of the session. RAMPAGE progresses from merely focusing on a RAMP warm-up and incorporates Activity, Games, and Evaluation into a comprehensive framework for the design, delivery and reflection of an entire practice or training session. The RAMPAGE structure can be adopted and integrated by practitioners for any form of youth field or court session (e.g., sport session, physical education session, strength and conditioning session), regardless of the stage of development of youth. Whilst the RAMPAGE session could be applied to a gym session, this article focuses upon its application within a field- or court-based setting. The potential advantages of implementing

a coaching session framework over an integrated neuromuscular warm up (e.g., FIFA 11+ (56, 57)) or warm up only framework (e.g., RAMP (33, 34)) are that it emphasises the importance to coaches of planning a fully aligned session that targets a range of physical, technical, tactical and psycho-social related goals important for LTAD rather than just standalone areas (e.g., technical only). As RAMPAGE provides a coaching session framework, it therefore allows coach flexibility, autonomy and variety over traditional integrated neuromuscular warm ups that are prescriptive in nature. This therefore presents a 'how' strategy for effective implementation of LTAD rather than focussing upon 'what' should be delivered as recently proposed (35).

Insert Figure 2 near here

RAISE

Raising the body and tissue temperature is important for injury prevention and improved motor performance (21, 45), thus it is recommended to start a RAMPAGE coaching session with a 'Raise' warm up activity. This section of the warm up has physiological (e.g., elevating body temperature, increase heart rate, increase extensibility and pliability of muscle) and psychological (e.g., increase focus, training preparation) benefits (33, 45) but also provides an opportunity to coach movement skills with appropriate quality and competence (33). A key focus of this part of the session is to have a purposeful and engaging activity as opposed to more 'traditional' means (e.g., running laps around the field or track). The 'Raise' section provides an ideal opportunity to develop fundamental locomotor skills in all directions (forward, backwards, lateral) and can provide youth with an opportunity to explore different movements, thereby increasing their breadth of movement strategies to produce an overall motor skill.

Table 1 summarises the locomotor skills that could be delivered in the 'Raise' section. The type of activity would depend upon the age and stage of the participants but could include obstacle courses and dynamic games (e.g., knee tag, chase activities) especially for younger and less experienced children, or more technically-focused activities such as linear running mechanics (e.g., A-March, A-Skip, A-Run) focussing upon movement quality and technique with older and more advanced athletes. Therefore, this section of the session should focus upon movement quality over intensity but still provide an intensity stimulus to achieve the physiological outcomes of a warm up (45). Furthermore, this section of the RAMPAGE **session** could also be an opportunity to challenge object control skills alongside a locomotor activity (e.g. carrying, catching and passing a ball whilst performing multidirectional movements).

Insert Table 1 near here

ACTIVATE & MOBILISE

As with current recommendations to undertake a dynamic-based warm up instead of static stretching (25, 50), the 'Activate' and 'Mobilise' sections provide an opportunity to

perform key dynamic movements to augment physical preparation and reduce injury risk. Dynamic movements usually incorporate a variety of stability and mobility skills to be able to be performed effectively (e.g., to perform a squat correctly requires effective stability and mobility skills). Therefore, we recommend focussing upon specific movement patterns that simultaneously activate and mobilise the muscles and joints rather than targeting these components as independent parts of the warm-up. It is recommended that these movement patterns focus upon the athletic motor skill competencies presented in Figure 1. Table 2 summarises the types of movements for the lower body, upper body and anti-rotation and core bracing athletic motor skill competencies that could be **applied**. These actions could again be delivered or structured in multiple ways including a traditional body weight strength circuit, animal walks / movements, partner-based games or inclusion of stability, strength and mobility challenges. However, whilst multiple activity structures could be used, a key element is for coaches to focus upon the key movement skill and competency of the exercises implemented (38, 42).

Insert Table 2 near here

PREPARE

The 'Prepare' section is focused on executing high-intensity movements such as sprinting, jumping or throwing with maximal effort. 'Prepare' in this section can be viewed from both short- and long-term perspectives (35). Short-term goals may be to ready the body for the high-intensity movements (e.g., rapid deceleration and change of direction) that may occur during the 'Activity' and 'Games' by performing these high intensity manoeuvres under more controlled conditions. Long-term goals may be to develop specific physical capacities such as maximal speed or change of direction ability, even if **these** physical **qualities** may not be used in the rest of the session. Research has demonstrated that regular exposure to high speed running is necessary both for the development of maximal velocity (58) and to protect against injury (44). As such regular exposure to these **types** of high intensity activities are essential for LTAD. 'Prepare' activities can include speed, agility and power-based activities, with a specific focus upon the athletic motor competencies of acceleration, deceleration and reacceleration, and jumping and rebounding, or potentially contact / wrestling activities for contact sports. Table 3 presents a variety of physical attributes that could be focussed upon during the 'Prepare' section of the session. As per previous sections, practitioners can vary *how* these exercises are structured and delivered, ranging from individual isolated efforts (e.g., maximal vertical jumps) to relays and races, or even dynamic games. For example, within a soccer session, relays including accelerations, decelerations and changes of direction could precede a soccer pass and possession-based activity. Ultimately, this should be directed by the individual needs and preferences of the young athletes and the subsequent focus of the session. While the main intention of this part of the session is for high-intensity, the competency of the movement (e.g., acceleration mechanics) should also be considered by the coach.

Insert Table 3 near here

ACTIVITY

The 'Activity' part of the RAMPAGE coaching session framework is most likely viewed as the main focus of the session by the practitioner. While the above sections can apply across multiple domains and sporting contexts (e.g., everyone should do an element of locomotor, stability, strength, mobility, speed and agility training), the activity section may be more focussed from a participant and sporting perspective. For example, fundamental movement skill development may remain the central focus for an 8-year-old involved in a school physical education lesson, building upon some aspects of skill development introduced at an earlier stage. However, for a 15-year-old soccer player there may be a focus upon sport-specific skills that may progress towards developing tactical performance alongside technical skills with advancing age and playing level. Therefore, this part of the session is very much salient upon the needs and aspirations of the young athlete(s). To illustrate this, two example RAMPAGE session plans are shown for an 8-year-old physical education class (Table 4) and a 14-year-old rugby team (Table 5).

Insert Table 4 near here

Insert Table 5 near here

GAMES

Games are a great opportunity to have fun and provide challenge within a training and practice session whilst also developing technical, tactical, physical and psycho-social aspects of LTAD. Therefore, the 'Games' part of a RAMPAGE session provides an opportunity to integrate some skills performed earlier in the session into a game scenario. Games can also provide an opportunity to indirectly develop endurance or metabolic capacities as well as speed and agility, which may be an added bonus for a coach if they have further aims **during** this part of the session (e.g., performing skills under pressure or fatigue). The implementation of games has become popularised by the term 'small-sided games', which have shown numerous benefits from both a physiological and skill acquisition perspective (24). However, it is dependent upon how the games are designed and implemented as to whether the desired metabolic and skill acquisition effect is achieved (36). Therefore, while coaches can use games for multiple reasons within their sessions, they should consider multiple factors and constraints (e.g. pitch size, number of players, rules, coach input) when designing their games for maximising enjoyment, player involvements and physiological responses (11). For example, dependent upon the session objective, coaches may implement a full sided game of the specific sport with a technical and tactical focus. Alternatively, coaches may design and implement a game of four players per side for **five** minutes without interruption and then have a recovery period between games for evaluation, corrections and questioning, which may develop aerobic energy systems alongside technical and tactical elements. Furthermore, coaches may implement **two** per

side tag-based games working for 30 seconds followed by 90 seconds rest for the development of anaerobic energy systems and locomotor skills. In summary, there are multiple options for game design linked to the session objectives that can be implemented according to the sport, objectives of the programme, and age and stage of the participants.

EVALUATE

Although evaluation of their participants should always be prominent throughout a **RAMPAGE** coaching session (see the following psycho-social section for more details), it is recommended to conclude a session with time devoted to 'Evaluate' the session. This can be incorporated within the traditional cool down aspect of a session (65) where a focus could be placed upon individual 'add-ons' including flexibility and/or landing mechanics (when fatigued), which are further important aspects for physical development. Therefore, combining cool down activities with evaluative processes may have multiple purposes including learning and psychological benefits which provide an opportunity for participants (and coaches) to reflect whether progress was made towards the objectives of the session (7, 62) and help foster consideration for the goals of the next session. This is an important process to help facilitate experiential learning and develop self-awareness alongside enhancing personal, social and athletic growth (12). Coaches should consider and plan suitable questions linked to the session objectives for this part of the session to facilitate appropriate reflection.

Holistic Support: Beyond the Physical Aspect

Within sports practice and LTAD, the development of all aspects of the athlete – physical, psycho-social, technical and tactical development - are key. Whilst numerous models suggest a holistic approach, limited guidelines are available for practitioners. Whilst the above sections focussed on the RAMPAGE framework, the explanations mainly explained the physical benefits. Therefore, the below sections aim to further consider the technical and tactical and psycho-social aspects of LTAD that are important to be considered with practitioners planning, delivery and review of youth sports practice (2).

Technical-Tactical Development

An athlete's ability to perform technical skills within the tactical environment of the sport is a prerequisite for successful performance. Therefore, sport practice and coaching sessions most often focus upon the technical and tactical demands of the sport. Models such as the Youth Physical Development (38) and Composite Youth Development (40) models have prescribed technical-tactical development via fundamental movement skills or sport-specific skills, dependent upon the age and stage of development of an individual. Therefore, it would seem appropriate that the technical-tactical development of a participant is a key component of the RAMPAGE coaching session framework. This is primarily evident within a RAMPAGE session through the 'Activity' and 'Games' sections where these phases afford coaches the opportunity to plan and deliver their technical and tactical content. However, a RAMPAGE session allows coaches to also implement technical

and tactical aspects during the RAMP part of the session (e.g., including catching and passing skills within a Raise activity). Although this may not be the primary objective, there is opportunity to align physical and technical development together and educate participants about the importance of technical skills, movement ability and physical development.

Although it is outside the scope of this paper to provide coaches with an understanding of the technical and tactical demands of their sport or domain, this has traditionally been known as their *what* knowledge (2, 62). Developing fundamental or sport-specific skills can be considered from a 'basic – complex – specialised skills' continuum (2) with a growing range of sport specific research available from a biomechanics or motor skill perspective (e.g., see (27) on the rugby tackle). From a tactical perspective, developing a game model and principles of play are key to establishing and developing tactical ability and decision making (54, 55). The planning and delivery of these technical and tactical aspects can be considered using the Rating of Perceived Challenge (28). This allows coaches to consider the relationship between the difficulty of the task and availability of information within the training environment to provide the challenge point of the session. Coaches could consider the ability of their participants, the session objectives and time of the season to manipulate constraints of the activity to provide an optimal challenge point for developing technical and tactical ability (28) and use the Rating of Perceived Challenge as a tool in the 'Evaluate' part of a session.

Psycho-Social Development

The psycho-social development of youth is a vital but often overlooked aspect of LTAD and holistic development (1, 9, 22, 31). The Composite Youth Development model (40) identified a number of psycho-socially orientated considerations for practitioners to focus upon when delivering LTAD programmes. These included exploration and social interaction during early childhood, peer relationships, empowerment and self-esteem during middle childhood and self-worth, self-confidence and sport-specific psychological skills during adolescence and into adulthood. However, Lloyd and colleagues (40) highlighted how the selected psycho-social traits within the Composite Youth Development Model were selected based on available literature from a single source of evidence (66) and from personal experiences of the authorship team. Although an age and staged approach to psycho-social development is provided, this anecdotal approach highlights several potential limitations with the methods used to understand psycho-social development in youth.

The RAMPAGE programme recommends focussing upon communication, control, confidence, concentration, resilience, presence, self-awareness, and commitment as key cornerstones of a psycho-social curriculum for LTAD and personal development. These eight characteristics were chosen based around broad findings of key psychological characteristics possessed by Olympic champions (22) and world-class athletes (43), along with specific psycho-social competencies for youth athletes (26, 46). Table 6 summarises the psycho-social characteristics for designing, delivering and reflecting upon a RAMPAGE session.

Insert Table 6 near here

It is recommended that coaches try to observe these key psycho-social characteristics through their athlete's behaviours to determine developmental needs. Practitioners should then purposefully plan and deliberately deliver activities and coaching behaviours to develop skills related to each psycho-social characteristic for holistic development. For example, coaches may plan how to develop the **psycho-social** characteristic of communication by creating session activities that could involve players working in small groups to solve a problem, to develop speaking, listening, and verbal reasoning skills, supported by facilitative coaching behaviour interventions (e.g., asking questions). Such strategies demonstrate the use of the RAMPAGE coaching session framework for enhancing physical, psycho-social, technical and tactical development related to an individual athlete's needs.

Considerations for the Implementation of RAMPAGE

Whilst the RAMPAGE coaching session framework has been recommended within this article to provide a framework for youth sport practitioners to improve LTAD, some considerations for the implementation of RAMPAGE are still required. Firstly, the upskilling of practitioners to design and deliver coaching sessions that are holistic is important. As previously highlighted, most sports coaches and physical education teachers do not have the luxury of specialist support (e.g., strength and conditioning, sport psychology) and are **solely** responsible for the holistic development of their participants. However, holistic LTAD is vital (40, 53) for enhancing health and fitness, alongside sport performance. Therefore, the RAMPAGE framework raises awareness and provides guidance to practitioners of *what* aspects of holistic development can be delivered *when* and *how* within a coaching session. Dependent upon the experience of the coach, this can be achieved by **either** providing activity menus for less experienced coaches or allowing more experienced practitioners to design and implement their own activities related to the RAMPAGE framework. Within the implementation of RAMPAGE within our own environments we have provided resources and coach education workshops to practitioners to raise awareness, understand the importance and provide session activities that could be implemented within their sessions.

Secondly, it has been recommended that **the RAMPAGE coaching session framework** can be delivered across multiple environments (e.g., physical education, youth sport) and aimed across youth participants (e.g., children to adolescents). Due to the flexibility and autonomy provided within the RAMPAGE framework, **this** means that practitioners can alter their activities but maintain the same session structure with their participants. Whilst many different activities can be considered, it is outside the scope of this article to provide guidance on this. However, it is important to highlight that practitioners should set session objectives and develop learning activities that are relevant and appropriate to their participants (e.g., age and stage, experience, training age), sport, context (e.g., physical education, sport, **talent development**) and own philosophy and background (62). Whilst RAMPAGE is presented as a coaching session framework, and help practitioners plan and

deliver individual sessions, more advanced or experienced practitioners may also consider how RAMPAGE fits within their medium to long term planning and goal setting (2, 37).

Finally, practitioners should consider both the volume, intensity and the movement quality and control of the activities prescribed during each section of a RAMPAGE session (39). For example, volume could be considered by the duration or number of repetitions of a session or its relevant parts with intensity considered as how intense an activity is. While there are no hard and fast rules for the prescription of volume and intensity it is acknowledged that the athlete's age and **training** experience is considered within the planning of training alongside the objectives of the session. For example, if the objective of the 'Games' section is to develop tactical understanding then the session may be of a lower intensity to allow learning and understanding, which compared to a 'Games' section that focuses upon metabolic conditioning and skill acquisition under fatigue. Furthermore, there should always be an emphasis on movement quality and control at all stages of a session (38, 42).

SUMMARY

Within LTAD, the multitude of benefits provided by appropriate methods and strategies of athletic development for youth are clear. However, despite the known benefits there are still many youth sports and physical activity programs that do not adequately implement **and foster** the holistic development of their participant within their sessions. Numerous reasons exist including a lack of education and understanding, practical competencies and time pressures. Thus, it is important that coaches, teachers and instructors know 'how' to effectively integrate LTAD into regular sport and physical education sessions in addition to the *why* and *when*. In this paper, an overview of a coaching session framework called RAMPAGE has been provided, which adapts and moves beyond a RAMP (33, 34) or integrative neuromuscular (30, 56) warm-up by integrating **Prepare, Activity, Games, and Evaluate**. The integration of a holistic approach, considering physical, psycho-social, technical and tactical development is viewed as key for the planning, delivery and implementation of LTAD.

RAMPAGE is a coaching session framework that aims to provide guidance for optimizing LTAD of all youth across multiple ages, stages and contexts. It provides a framework that coaches can use for planning, delivery and reflection of field and court sessions to ensure the holistic development of their participants are central to the programs they deliver. This framework provides a call for action for developing continued professional development by educating and upskilling coaches to deliver RAMPAGE coaching sessions in a variety of contexts and hopefully improve the health, fitness, physical activity and sporting performance of all youths regardless of their sport and level.

References

1. Abbott A and Collins D. Eliminating the dichotomy between theory and practice in talent identification and development: considering the role of psychology. *Journal of Sports sciences* 22: 395-408, 2004.
2. Abraham A, Saiz S, Mckeown S, Morgan G, Muir B, North J, and Till K. Planning your coaching: A focus on youth participant development, in: *Practical Sports Coaching*. C Nash, ed. Abingdon: Routledge, 2014, pp 16-53.
3. Bailey R, Collins D, Ford P, MacNamara Á, Toms M, and Pearce G. Participant development in sport: An academic review. *Sports Coach UK* 4: 1-134, 2010.
4. Balyi I and Hamilton A. Long-term athlete development: trainability in childhood and adolescence. *Olympic Coach* 16: 4-9, 2004.
5. Bergeron MF, Mountjoy M, Armstrong N, Chia M, Côté J, Emery CA, Faigenbaum A, Hall G, Kriemler S, and Léglise M. International Olympic Committee consensus statement on youth athletic development. *Br J Sports Med* 49: 843-851, 2015.
6. Brenner JS. Council on Sports Medicine and Fitness. Sports specialization and intensive training in young athletes. *Pediatrics* 138: 2016-2148, 2016.
7. Carroll M, Curtis L, Higgins A, Nicholl H, Redmond R, and Timmins F. Is there a place for reflective practice in the nursing curriculum? *Nurse Education in Practice* 2: 13-20, 2002.
8. Cohen D, Voss C, Taylor M, Delextrat A, Ogunleye A, and Sandercock G. Ten-year secular changes in muscular fitness in English children. *Acta Paediatrica* 100: e175-e177, 2011.
9. Côté J, Turnnidge J, and Vierimaa M. A personal assets approach to youth sport. *Routledge handbook of youth sport*: 243-255, 2016.
10. Côté J and Vierimaa M. The developmental model of sport participation: 15 years after its first conceptualization. *Science & Sports* 29: S63-S69, 2014.
11. Cronin J, Harrison C, Lloyd RS, and Spittle M. Modifying games for improved aerobic fitness and skill acquisition in youth. *Strength & Conditioning Journal* 39: 82-88, 2017.
12. Cropley B, Miles A, Hanton S, and Niven A. Improving the delivery of applied sport psychology support through reflective practice. *The Sport Psychologist* 21: 475-494, 2007.
13. Donaldson A, Lloyd DG, Gabbe BJ, Cook J, and Finch CF. We have the programme, what next? Planning the implementation of an injury prevention programme. *Injury prevention* 23: 273-280, 2017.
14. Drust B and Green M. Science and football: evaluating the influence of science on performance. *Journal of sports sciences* 31: 1377-1382, 2013.
15. Eisenmann J. Translational Gap between Laboratory and Playing Field: New Era to Solve Old Problems in Sports Science. *Translational Journal of the American College of Sports Medicine* 2: 37-43, 2017.
16. Faigenbaum AD and Rebullido TR. Understanding Physical Literacy in Youth. *Strength & Conditioning Journal* 40: 90-94, 2018.
17. Finch CF. No longer lost in translation: the art and science of sports injury prevention implementation research. *Br J Sports Med* 45: 1253-1257, 2011.
18. Ford P, De Ste Croix M, Lloyd R, Meyers R, Moosavi M, Oliver J, Till K, and Williams C. The long-term athlete development model: Physiological evidence and application. *Journal of sports sciences* 29: 389-402, 2011.
19. Fort-Vanmeerhaeghe A, Romero-Rodriguez D, Lloyd RS, Kushner A, and Myer GD. Integrative neuromuscular training in youth athletes. Part II: Strategies to prevent injuries and improve performance. *Strength and Conditioning Journal* 38: 9-27, 2016.
20. Gilbert W. *Coaching better every season: A year-round system for athlete development and program success*. Human Kinetics, 2016.
21. Gomes Neto M, Conceição CS, de Lima Brasileiro AJA, de Sousa CS, Carvalho VO, and de Jesus FLA. Effects of the FIFA 11 training program on injury prevention and performance in football players: a systematic review and meta-analysis. *Clinical rehabilitation* 31: 651-659, 2017.

22. Gould D, Dieffenbach K, and Moffett A. Psychological characteristics and their development in Olympic champions. *Journal of applied sport psychology* 14: 172-204, 2002.
23. Gulbin JP, Croser MJ, Morley EJ, and Weissensteiner Jr. An integrated framework for the optimisation of sport and athlete development: A practitioner approach. *Journal of sports sciences* 31: 1319-1331, 2013.
24. Hammami A, Gabbett TJ, Slimani M, and Bouhlef E. Does small-sided games training improve physical-fitness and specific skills for team sports? A systematic review with meta-analysis. *The Journal of sports medicine and physical fitness*: 1-25, 2017.
25. Hammami A, Zois J, Slimani M, Russel M, and Bouhlef E. The efficacy, and characteristics, of warm-up and re-warm-up practices in soccer players: a systematic review. *The Journal of sports medicine and physical fitness*: x-x, 2016.
26. Harwood C. Developmental consulting in a professional football academy: The 5Cs coaching efficacy program. *The sport psychologist* 22: 109-133, 2008.
27. Hendricks S, Till K, Oliver JL, Johnston RD, Attwood M, Brown J, Drake D, MacLeod S, Mellalieu SD, and Treu P. Technical skill training framework and skill load measurements for the rugby union tackle. *Strength & Conditioning Journal* 40: 44-59, 2018.
28. Hendricks S, Till K, Oliver JL, Johnston RD, Attwood MJ, Brown JC, Drake D, MacLeod S, Mellalieu SD, and Jones B. Rating of perceived challenge as a measure of internal load for technical skill performance. *Br J Sports Med* 53: 611-613, 2019.
29. Hislop M, Stokes K, Williams S, McKay C, England M, Kemp S, and Trewartha G. The efficacy of a movement control exercise programme to reduce injuries in youth rugby: a cluster randomised controlled trial. *BMJ open sport & exercise medicine* 2: e000043, 2016.
30. Hislop MD, Stokes KA, Williams S, McKay CD, England ME, Kemp SP, and Trewartha G. Reducing musculoskeletal injury and concussion risk in schoolboy rugby players with a pre-activity movement control exercise programme: a cluster randomised controlled trial. *Br J Sports Med* 51: 1140-1146, 2017.
31. Holt NL. *Positive youth development through sport*. Routledge, 2016.
32. Ireton MR, Till K, Weaving D, and Jones B. Differences in the movement skills and physical qualities of elite senior and academy rugby league players. *The Journal of Strength & Conditioning Research* 33: 1328-1338, 2019.
33. Jeffreys I. Warm up revisited—the ‘ramp’ method of optimising performance preparation. *UKSCA Journal* 6: 15-19, 2006.
34. Jeffreys I. Warm-Up and flexibility training, in: *Essentials of Strength Training and Conditioning*. GG Haff, TN Triplett, eds. Illinois, United States: Human Kinetics, 2016, pp 317-350.
35. Jeffreys I. The Warm-up: A Behavioral Solution to the Challenge of Initiating a Long-Term Athlete Development Program. *Strength & Conditioning Journal* 41: 52-56, 2019.
36. Leek D, Carlson JA, Cain KL, Henrichon S, Rosenberg D, Patrick K, and Sallis JF. Physical activity during youth sports practices. *Archives of pediatrics & adolescent medicine* 165: 294-299, 2011.
37. Lloyd RS, Cronin JB, Faigenbaum AD, Haff GG, Howard R, Kraemer WJ, Micheli LJ, Myer GD, and Oliver JL. National Strength and Conditioning Association position statement on long-term athletic development. *The Journal of Strength & Conditioning Research* 30: 1491-1509, 2016.
38. Lloyd RS and Oliver JL. The youth physical development model: A new approach to long-term athletic development. *Strength & Conditioning Journal* 34: 61-72, 2012.
39. Lloyd RS and Oliver JL. *Strength and conditioning for young athletes: science and application*. Routledge, 2019.
40. Lloyd RS, Oliver JL, Faigenbaum AD, Howard R, Croix MBDS, Williams CA, Best TM, Alvar BA, Micheli LJ, and Thomas DP. Long-term athletic development-part 1: a pathway for all youth. *The Journal of Strength & Conditioning Research* 29: 1439-1450, 2015.

41. Lloyd RS, Oliver JL, Faigenbaum AD, Howard R, Croix MBDS, Williams CA, Best TM, Alvar BA, Micheli LJ, and Thomas DP. Long-term athletic development, part 2: barriers to success and potential solutions. *The Journal of Strength & Conditioning Research* 29: 1451-1464, 2015.
42. Lloyd RS, Oliver JL, Radnor JM, Rhodes BC, Faigenbaum AD, and Myer GD. Relationships between functional movement screen scores, maturation and physical performance in young soccer players. *Journal of sports sciences* 33: 11-19, 2015.
43. MacNamara Á, Button A, and Collins D. The role of psychological characteristics in facilitating the pathway to elite performance part 1: Identifying mental skills and behaviors. *The Sport Psychologist* 24: 52-73, 2010.
44. Malone S, Owen A, Mendes B, Hughes B, Collins K, and Gabbett TJ. High-speed running and sprinting as an injury risk factor in soccer: Can well-developed physical qualities reduce the risk? *Journal of science and medicine in sport* 21: 257-262, 2018.
45. McGowan CJ, Pyne DB, Thompson KG, and Rattray B. Warm-up strategies for sport and exercise: mechanisms and applications. *Sports medicine* 45: 1523-1546, 2015.
46. Mitchell TO, Nesti M, Richardson D, Midgley AW, Eubank M, and Littlewood M. Exploring athletic identity in elite-level English youth football: a cross-sectional approach. *Journal of sports sciences* 32: 1294-1299, 2014.
47. Moody JA, Naclerio F, and Green P. Motor skill development in youths, in: *Strength and Conditioning for Young Athletes*. R Lloyd & J Oliver eds. Abingdon, Routledge, 2013, pp 71-87.
48. Norcross MF, Johnson ST, Bovbjerg VE, Koester MC, and Hoffman MA. Factors influencing high school coaches' adoption of injury prevention programs. *Journal of science and medicine in sport* 19: 299-304, 2016.
49. Ogden CL, Carroll MD, Lawman HG, Fryar CD, Kruszon-Moran D, Kit BK, and Flegal KM. Trends in obesity prevalence among children and adolescents in the United States, 1988-1994 through 2013-2014. *Jama* 315: 2292-2299, 2016.
50. Opplert J and Babault N. Acute effects of dynamic stretching on muscle flexibility and performance: an analysis of the current literature. *Sports Medicine* 48: 299-325, 2018.
51. Pichardo AW, Oliver JL, Harrison CB, Maulder PS, and Lloyd RS. Integrating models of long-term athletic development to maximize the physical development of youth. *International Journal of Sports Science & Coaching* 13: 1189-1199, 2018.
52. Pomares-Noguera C, Ayala F, Robles-Palazón FJ, Alomoto-Burneo JF, López-Valenciano A, Elvira JL, Hernández-Sánchez S, and De Ste Croix M. Training effects of the FIFA 11+ kids on physical performance in youth football players: A randomized control trial. *Frontiers in pediatrics* 6: 40, 2018.
53. Rees T, Hardy L, Güllich A, Abernethy B, Côté J, Woodman T, Montgomery H, Laing S, and Warr C. The great British medalists project: a review of current knowledge on the development of the world's best sporting talent. *Sports Medicine* 46: 1041-1058, 2016.
54. Richards P, Collins D, and Mascarenhas DR. Developing rapid high-pressure team decision-making skills. The integration of slow deliberate reflective learning within the competitive performance environment: A case study of elite netball. *Reflective Practice* 13: 407-424, 2012.
55. Richards P, Collins D, and Mascarenhas DR. Developing team decision-making: a holistic framework integrating both on-field and off-field pedagogical coaching processes. *Sports Coaching Review* 6: 57-75, 2017.
56. Rössler R, Donath L, Bizzini M, and Faude O. A new injury prevention programme for children's football—FIFA 11+ Kids—can improve motor performance: a cluster-randomised controlled trial. *Journal of sports sciences* 34: 549-556, 2016.
57. Rössler R, Junge A, Bizzini M, Verhagen E, Chomiak J, Aus der Fünten K, Meyer T, Dvorak J, Lichtenstein E, and Beaudouin F. A multinational cluster randomised controlled trial to assess the efficacy of '11+ Kids': a warm-up programme to prevent injuries in children's football. *Sports Medicine* 48: 1493-1504, 2018.

58. Rumpf MC, Lockie RG, Cronin JB, and Jalilvand F. Effect of different sprint training methods on sprint performance over various distances: a brief review. *Journal of strength and conditioning research* 30: 1767-1785, 2016.
59. Sandercock GR and Cohen DD. Temporal trends in muscular fitness of English 10-year-olds 1998–2014: An allometric approach. *Journal of science and medicine in sport* 22: 201-205, 2019.
60. Tee JC, McLaren SJ, and Jones B. Sports injury prevention is complex: we need to invest in better processes, not singular solutions. *Sports medicine*: 1-14, 2019.
61. Till K, Morley D, Cobley S, Cupples B, and O'Connor D. Talent Identification and Development in Rugby, in: *The Science of Sport: Rugby*. Marlborough: Crowood Press, 2015, pp 139-150.
62. Till K, Muir B, Abraham A, Piggott D, and Tee J. A framework for decision-making within strength & conditioning coaching. *Strength & Conditioning Journal*, 2018.
63. Tremblay MS, Barnes JD, González SA, Katzmarzyk PT, Onywera VO, Reilly JJ, Tomkinson GR, and Team GMR. Global Matrix 2.0: report card grades on the physical activity of children and youth comparing 38 countries. *Journal of physical activity and health* 13: S343-S366, 2016.
64. Tremblay MS, Costas-Bradstreet C, Barnes JD, Bartlett B, Dampier D, Lalonde C, Leidl R, Longmuir P, McKee M, and Patton R. Canada's Physical Literacy Consensus Statement: process and outcome. *BMC Public Health* 18: 1034, 2018.
65. Van Hooren B and Peake JM. Do we need a cool-down after exercise? A narrative review of the psychophysiological effects and the effects on performance, injuries and the long-term adaptive response. *Sports Medicine* 48: 1575-1595, 2018.
66. Visek AJ, Harris BS, and Blom LC. Mental training with youth sport teams: Developmental considerations and best-practice recommendations. *Journal of sport psychology in action* 4: 45-55, 2013.
67. Whitehead 1 M. The concept of physical literacy. *European Journal of Physical Education* 6: 127-138, 2001.
68. Woods CT, Raynor AJ, Bruce L, McDonald Z, and Robertson S. The application of a multi-dimensional assessment approach to talent identification in Australian football. *Journal of sports sciences* 34: 1340-1345, 2016.
69. Wright MD and Laas M-M. Strength training and metabolic conditioning for female youth and adolescent soccer players. *Strength & Conditioning Journal* 38: 96-104, 2016.

Figure Legends

Figure 1. Eight Athletic Motor Skill Competencies for Long-Term Athletic Development (41, 47)

Figure 2. RAMPAGE Coaching Session Framework