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Long-Term Rugby Player Development: Strategies & Complications: A Review

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Abstract

Long-term player development in rugby is a complex process that involves physical, technical, tactical, and mental growth. This progression follows structured models like the Long-Term Athlete Development (LTAD) framework. Key factors for maximizing a player's potential over time include learning basic movement skills at a young age, age- appropriate sport-specific training, structured training phases, and strength and conditioning programs tailored to different playing positions. Starting with multiple sports rather than specializing too early helps players develop a strong foundation of motor skills while reducing injury risks. This well-rounded approach benefits both their physical and mental development, leading to better long-term performance. However, implementing LTAD effectively in rugby comes with several challenges. Early specialization increases the risk of burnout and injuries, especially since young athletes' bodies are still growing. To understand these challenges, a systematic review was conducted using various online databases. Out of 30 relevant sources, 25 were journal articles, one was a book, two were federation modules, and two were grey literature sources. Given rugby's high-contact nature, injuries are common. Programs like World Rugby's Activate initiative are strongly recommended to help reduce the occurrence of concussions, ligament injuries, sprains, and muscle strains. Another major challenge is player retention, particularly during transitions from youth to senior levels. Many young players drop out due to unrealistic expectations, increased pressure, and a lack of proper support. Socio-economic and geographical barriers also play a significant role. Players from underprivileged backgrounds often have limited access to quality coaching and training facilities. To address these issues, rugby needs more inclusive pathways, fair distribution of resources, and innovative solutions like wearable technology to monitor player workload and optimize training. This review highlights the importance of personalized development plans, ongoing injury prevention strategies, and increased access to rugby opportunities. Future research should focus on refining LTAD models, creating standardized evaluation tools, and developing adaptable, evidence-based training programs to ensure sustainable and equitable player development.

INTRODUCTION

The Long-Term Athlete Development (LTAD) model is now widely accepted in many sports as a roadmap to help athletes grow physically, technically, mentally, and socially. It aims to maximize their potential while reducing the risk of injuries and burnout. Originally introduced by Balyi (2001), LTAD emphasizes that training, competition, and recovery should be tailored to an athlete's stage of development.

This model is especially relevant for rugby, a high-impact sport that requires both physical and mental toughness. Rugby players need strength, speed, endurance, and tactical awareness, all while enduring intense physical contact and long periods of movement (Ford et al., 2011). To succeed in the short term and ensure long-term health and safety, LTAD principles must be applied effectively. A core idea in LTAD is age-appropriate training, which means athletes should progress through structured stages of development. Starting sports at a young age helps build fundamental movement skills, which later support specialized training and peak performance. However, research shows that specializing in one sport too early especially contact sports like rugby can lead to a higher risk of injuries and burnout (Jayanthi et al., 2013). On the other hand, playing multiple sports helps athletes develop a broader skill set, lowers injury risks, and improves mental well-being by keeping training fun and varied (Cote et al., 2007).

The LTAD model outlines key developmental stages. The "fundamentals" phase (ages 6-9) focuses on basic movement skills, while the "learning to train" phase (ages 9-12) introduces sport-specific techniques. The "training to compete" phase (ages 16-18) sharpens performance skills and prepares athletes for high-level competition (Balyi & Hamilton, 2004). These structured stages ensure that training aligns with both physical and mental development, reducing the likelihood of overuse injuries. In LTAD-based programs, different aspects of development are carefully considered, including strength training, skill development, and mental resilience. Strength training is particularly important as athletes grow, helping to increase power and prevent injuries during physically demanding moments like tackling (Fuller et al., 2017). Mental preparation is just as crucial—techniques such as goal setting and stress management help players handle pressure and stay focused in tough game situations (Posthumous, 2013). Well-designed training programs allow young players to gradually build the skills and endurance needed for rugby's increasing demands while emphasizing injury prevention and recovery (Lloyd & Oliver, 2012).

Despite the many benefits of LTAD, there are challenges in putting it into practice in rugby. One major issue is the high injury rate, particularly in youth rugby, where players are exposed to frequent physical contact and collisions (Fuller et al., 2017). Concussions, ligament injuries, and muscle strains are common. Programs like World Rugby's Activate have been proven to reduce injuries, yet many players and coaches struggle with consistent implementation, highlighting the need for better education and adherence (Gabbett, 2016). Additionally, while LTAD aims to create a smooth transition between age groups, moving from youth to senior rugby can be difficult due to the increased physical and mental demands of higher level play. As players move to higher levels in rugby, they face tougher competition and must commit more seriously to the sport. This transition can bring both physical and mental stress (Wylleman et al., 2013). To help players manage these challenges and stay engaged in the sport, it's important to have strong mentorship, support systems, and clear communication channels during these key developmental phases.

Beyond personal challenges, external factors like socio-economic status and geographic location also affect how well LTAD strategies can be applied in rugby. Access to quality coaching, proper facilities, and competitive opportunities is often limited—especially for players from rural areas or lower-income backgrounds (Rothwell et al., 2019). These inequalities can make it harder for some athletes to fully benefit from LTAD programs, reducing their chances of reaching their full potential in rugby. Overcoming these barriers is essential to ensuring that all athletes, no matter their background, have a fair chance to develop and grow in the sport (Beaudoin et al., 2015). Another concern is starting rugby too early. While some researchers argue that early specialization helps develop skills quickly, it has also been linked to overuse injuries, burnout, and dropping out of the sport at a young age (Hendricks, 2012). On the other hand, being involved in multiple sports helps young athletes build a broader range of physical and motor skills, which can benefit them in rugby over the long term while also lowering their risk of injury (Cote et al., 2007). Incorporating multi-sport participation within LTAD supports a well-rounded athletic foundation and reduces some of these risks.

This literature review will explore key approaches to developing rugby players using the LTAD framework. Topics will include the importance of early physical literacy, multi-sport participation, strength and conditioning, and mental preparation. It will also take a critical look at the challenges of LTAD, such as injury risks, loss of motivation, financial limitations, and the drawbacks of early specialization. By addressing these issues, this review aims to highlight both the obstacles and potential solutions for improving rugby player development at all levels of the game.

METHODS

This literature review explores the strategies, challenges, and effects of Long-Term Athlete Development (LTAD) in rugby, drawing from various theories and real-world applications. The goal is to examine effective LTAD strategies, potential obstacles, and their impact on developing rugby players. A narrative synthesis approach is used, as it allows for a detailed discussion of research findings and helps provide a well-rounded understanding of LTAD in rugby a sport that involves physical, technical, tactical, psychological, and socio-cultural aspects. The review is based on qualitative insights from 25 journal articles, one book, two federation modules, and two pieces of grey literature published over the past 16 years. Focusing on studies from 2007 to 2023 ensures that recent issues and trends in rugby development are considered (Cote et al., 2012). The main aim is to understand how LTAD frameworks are applied in rugby, the challenges faced by both players and coaches, and how these frameworks are structured.

To gather reliable information, this review draws from key databases in sports science, coaching, and psychology fields that are essential for explaining LTAD in rugby. The main search terms used include Long-Term Athlete Development, rugby player pathways, injury prevention in rugby, multi-sport participation, and LTAD challenges in rugby. The research findings are grouped by topic to align with LTAD principles and approaches. One key focus of this review is how engaging in multiple sports during childhood affects athlete development. Studies suggest that exposing children to a variety of sports at an early age helps them develop fundamental skills while reducing the negative effects of early specialization in rugby (Lloyd & Oliver, 2012). This section also examines phased models like Balyi's LTAD framework, which emphasizes structured training and progression according to age groups. The review looks at how these models are applied in rugby and how they align with key growth stages (Ford et al., 2011).

A large part of the literature focused on injuries in rugby, especially concussions and musculoskeletal injuries. Research highlighted the importance of injury prevention programs, such as the World Rugby Activate program, in reducing these risks (Posthumus, 2013). This section also explored mental resilience, stress management, and confidence-building as essential factors in player development. Studies showed that using psychological strategies helped rugby players handle competition and make better tactical decisions under pressure (Till et al., 2022).Another key area of research examined the social and economic barriers affecting rugby development. Many studies pointed out that access to quality coaching and resources is not equal for all players. One significant study found that athletes from underprivileged backgrounds often have fewer opportunities for growth, making it harder for them to succeed in the sport (Rothwell et al., 2019).

To ensure the studies reviewed were relevant and reliable for understanding Long-Term Athlete Development (LTAD) in rugby, we used specific criteria to evaluate them. These included Validity is Checking if the study's design aligned with LTAD principles. Reliability is Assessing whether the findings could be consistently applied to different groups and settings. Specificity is Ensuring the study focused on rugby and its unique LTAD challenges. Knowledge contribution is Determining how much the research advanced our understanding of LTAD in rugby.By analyzing the results, we assessed both the effectiveness of LTAD strategies and the main challenges involved. The findings combined both theoretical and practical insights, helping us form a narrative synthesis that highlights areas for future research. In particular, we identified gaps in the existing literature where more focus is needed on how socio-economic factors influence LTAD in rugby (Beaudoin et al., 2015).Based on our findings, we suggest future research and practical approaches that emphasize personalized training, multi-sport participation, and a more comprehensive approach to injury prevention and management.

RESULTS

The patterns observed in the literature largely stem from research on rugby in general, as well as the sustainable development of rugby players through LTAD, particularly in Myanmar. The findings highlight that athlete development is a multi-stage process involving various aspects, including injury prevention, psychological skill development, and socio-cultural influences (Table 1). Several studies support these conclusions, arguing for early participation in rugby, the expansion of the sport, strength and conditioning training, rehabilitation, and mental strategies. However, challenges such as early specialization, physical limitations, and a high injury rate continue to hinder the effective implementation of these strategies.One of the key takeaways from the literature is the importance of starting sports at a young age and participating in multiple sports before specializing in rugby. Côté et al. (2007) and Jayanthi et al. (2013) suggest that exposure to different sports before the age of twelve helps develop essential physical skills like coordination and agility, as well as cognitive abilities such as decision-making. These skills are crucial in rugby, where players need both physical and mental capabilities to compete effectively. Additionally, early specialization in a single sport increases the risk of overuse injuries, whereas participating in multiple sports reduces this risk (Côté&Vierimaa, 2014).

Lloyd and Oliver (2012) also emphasize that LTAD strategies for rugby should encourage young athletes to engage in various sports until adolescence to support better overall athletic development. Studies further indicate that players who specialize in rugby before the age of twelve are more likely to experience burnout and frequent injuries compared to those who take a multi-sport approach (Jayanthi et al., 2013). Multi-sport athletes tend to have fewer injury- related setbacks and are able to sustain longer careers. Research supports the idea that a diversified approach to sports participation helps with injury recovery, extends an athlete's career, and fosters a more positive long-term experience in sports (Lloyd & Oliver, 2012).

Table 1. The Long term athlete development stages and corresponding physical, technical, and mental milestones in rugby player development (Jayanthi et al., 2013) (Lloyd & Oliver, 2012).

Stage	Age Range	Physical Development	Technical Development	Mental Development
Fundamental	6 to 9	balance, coordination, flexibility	Fundamentals movement patterns	enjoy, early teamwork
Learning to the Train	9 to 12	Aerobic development, strength practices	Capabilities development, tactics awareness	enhance focus, team bond
Training to the Train	12 to 16	Endurance, Strength, speed	Game sense Position specific skills	Coping with competition pressure
Training to the Compete	16 to 18	Agility, Explosive power	Advanced tactics, game analysis	Mental toughness, resilience
Training to the Win	18+	Maximum performance, maintenance of condition	Refinement of whole skills	High level of focus and Mental preparation

Position Specific Strength and Conditioning

Research highlights the importance of incorporating strength and conditioning (S&C) programs into rugby training. Since rugby is a high-contact sport, players need physical conditioning

tailored to their specific positions. Forwards, for example, need significant strength and endurance to handle scrums and tackles, while backs rely on agility and speed to perform well in open play.Jones et al. (2014) and Lloyd and Oliver (2012) emphasize that S&C programs should be designed based on a player's age and playing position to help them prepare for matches. Developing muscular endurance and proper movement mechanics through strength training from an early age can significantly lower the risk of injuries. Barbaric et al. found that starting resistance training in childhood and continuing through adolescence can help reduce common rugby injuries while improving muscular strength and endurance (Lloyd & Oliver, 2012).Other studies also highlight the risks of inadequate conditioning, showing that a lack of proper strength training increases the chances of injury and negatively impacts performance (Bishop et al., 2017). To maximize performance and player safety, strength programs must be designed with careful consideration of both the player's position on the field and their stage of development.

Injury Prevention and Management

Preventing injuries is a major priority in rugby, especially since the sport has a high injury rate, particularly among young players, as shown in Table 2. Fuller et al. (2017) highlight a worrying statistic, reporting that rugby players experience 86.9 injuries per 1,000 playing hours. Concussions and musculoskeletal injuries are among the most common, making injury prevention strategies essential for player safety and long-term participation in the sport.

Table 2. Injury rates in sports. Fuller et al. (2017)

Sports	Injuries (Per 1000 player hours)	Injury Types
Rugby	85.5	Fractures, Concussions, sprains
American Football	73.4	fractures, Concussions, sprains
Football	30.2	Contusions, Sprains, strains,
Basketball	25.8	knee injuries ,Ankle sprains

This becomes even clearer when looking at injury prevention programs like the World Rugby Activate program, which focuses on warm-ups and neuromuscular training to help reduce injuries (World Rugby, 2020). These strategies aim to prevent both sudden injuries and those caused by repeated strain by improving players' physical strength and ability to handle the demands of the game. Research by Ferguson et al. (2013) and World Rugby (2016) shows that the Activate program is effective in lowering injury rates, especially among younger players. However, one ongoing challenge is that these programs are not used consistently at all levels of rugby. Many teams, particularly at the grassroots level, struggle to access proper coaching and training resources, which limits how much they can benefit from these injury prevention methods.

Psychological Skills and Mental Preparation

Another key finding is the importance of Psychological Skills Training (PST) for building mental resilience within the framework of LTAD. Rugby is not only physically demanding but also mentally challenging, where factors like decision-making, focus, and emotional control play a big role in performance. Gould et al. (2002) and Vealey (2007) stress the importance of mental skills training, using techniques such as goal setting, mental rehearsal, and stress management to help players stay calm and focused during the most intense moments of a game.

While the psychological aspect of rugby player development is starting to receive more attention in research, issues like anxiety and stress fatigue are still often overlooked in young athletes. Gould et al. (2002) highlight the importance of mental preparation alongside physical training, especially as players progress to higher levels. It's essential that player welfare programs include not just physical training, but also comprehensive mental health support to help players cope with the pressures of sports.

DISCUSSION

Although the LTAD model outlines a clear development pathway for rugby players, its successful implementation can be hindered by several challenges. Issues like early specialization, the risk of injuries, and social or cultural factors need to be carefully managed to ensure these development strategies work in the long term.

Early Specialization and Overuse Injuries

One of the biggest challenges in LTAD for rugby players is early specialization. When young athletes focus too much on just one sport, they might develop specific skills faster, but they also risk overuse injuries, burnout, and even quitting competitive sports early (as shown in Table 3). The pressure from the sports community for young players to perform at a high level can leave them physically and mentally drained. Instead of focusing solely on rugby, it's important for young athletes to explore a variety of sports in the earlier stages to help build a well-rounded athletic foundation (Cote et al., 2009; Gould et al., 2008).

Table 3. The developmental model: A pathway to excellence. Cote et al. (2009)

Complication	Description
Early Specialization	An early concentration on one sport can reduce skill diversity and raise the risk of injury.
Injury Risk	Early training intensity can lead to long-term problems and overuse injuries.
Burn-out	Early competition that is too intense can cause mental exhaustion and a decline in enthusiasm for the sport.

Engaging in multiple sports helps young athletes develop a range of physical and mental skills that can benefit their rugby performance later on. It also offers psychological benefits, such as reducing pressure and giving them a break from focusing solely on one sport. This approach has been shown to support better development in children as they get older, particularly for those who participated in multiple sports early on (Cote et al., 2012). On the other hand, specializing in one sport too early can lead to physical and mental health issues. Young athletes who focus solely on rugby may experience burnout due to intense training and competition. Moreover, not being exposed to other sports can result in imbalanced physical development, which increases the risk of injuries and psychological stress (Jayanthi et al., 2015).

Injury Risks and Prevention Programs

In rugby, preventing injuries is a key concern because the sport involves a lot of physical contact, which leads to many injuries. Studies by Fuller et al. (2017) and Ferguson et al. (2013) show that common injuries in rugby, especially among young players, include concussions, muscle strains, and ligament sprains. To reduce these injuries, there are programs like "World Rugby Activate," which have been shown to be effective. However, there is still an issue with how these programs are implemented, especially at lower levels of the sport.

For these injury prevention programs to work well, they should be applied widely, but also tailored to the specific needs of players based on their injuries. For example, the "Activate" program can lower injury risks if it focuses on proper warm-ups, neuromuscular fitness, and injury prevention strategies (World Rugby, 2020). However, these programs are usually only followed where there are enough resources, which is often not the case in smaller rugby organizations. Because of this, it's important to make sure that these injury prevention programs are also included in the training of rugby coaches at all levels, not just for top-tier players, to help prevent long-term issues for players.

Psychological Skills and Mental Health Challenges

Being mentally tough and ready to play is just as important as physical training for a rugby player. Research shows that players can be taught psychological skills that help them perform well under pressure, stay focused, and manage their emotions (Gould et al., 2002; Vealey, 2007). However, mental health issues like stress and anxiety are common among young athletes but often go untreated. Experts suggest that mental health support for rugby players should be part of their overall mental

conditioning, as these issues are psychological by nature, not just physical.

The progress of rugby players depends on a strong understanding of the principles of Long-Term Athlete Development (LTAD), the psychological demands of the game, injury prevention strategies, and managing transitions. Research highlights that structured training, when done at the right age, helps balance performance and safety, and should be backed by programs that build mental resilience to handle stress and prevent burnout in tough situations. However, challenges still exist, such as poor adherence to injury prevention programs, socio-economic barriers, and the risks of early specialization. To support sustainable development and well- being in rugby, approaches like mentoring, inclusive policies, and encouraging multi-sport participation are recommended. These strategies are further explained in detail in Table 4.

Table 4. Summary Chart of The Reviewed Articles

Author(s)	Title/Focus	Strategies	Complications	Recommendations
Balyi (2001) Balyi, Hamilton (2004) Ford et al. (2011) Lloyd & Oliver (2012)	LTAD, stages, model, phases, principles	age-appropriate instruction, organized phases of development from the foundations to performance at the highest level, S&C programs that are age- appropriate .	Stage overlap and noncompliance with progression. burnout and overuse injuries. Performance declines and injuries are more common when age and position- specific training is lacking.	Prioritize training tailored to each developmental stage in order to strike a balance between performance and injury avoidance. Programs for design development that correspond with the stages of LTAD growth. For maximum safety and effectiveness, customize S&C programs according to age, playing position, and developmental stages.
Gould (2002); Vealey (2007) Posthumous (2013) Ford et al. (2011) Till et al. (2022)	Psychological demands, Rugby mental techniques, development, and preparation	Goal-setting, psychological resilience training, stress management, all-around development, and mental skills training for stress management	Tactical decision-making, high-intensity physical collisions, and the possibility of burnout and mental stress during competitive situations	Incorporate a variety of training techniques to meet the demands of rugby. Include techniques for mental development in rugby training regimens. Include psychological assistance in programs for the welfare of players..
Lloyd & Oliver (2012)	Adaptation to rugby challenges	Training that is structured and incorporates injury prevention and recovery	Transition issues between rugby at the youth and adult levels	Identify transitional challenges and offer specialized training programs.

Ferguson et al. (2013); World Rugby (2020) Gabbett et al. (2016) Posthumus (2013)	Injury prevention and Management in rugby, Injury rates, Strength training	The World Rugby Activate program's implementation, Strength training can reduce injuries and boost power.	poor compliance with injury prevention initiatives, high rate of injuries combined with unequal grassroots program adoption, Access to resources was restricted in lower-ranking rugby regions due to a lack of universal application across tiers.	Boost knowledge of and compliance with injury prevention initiatives, Increase program accessibility and prioritize coaching education for all levels of coaches. Encourage the consistent use of LTAD principles and attend to the needs of each stage.
Wylleman et al. (2013)	Rugby's transition from youth to senior	Structured support networks and mentorship	Stress, fiercer competition, and high commitment expectations	Create networks of support and mentorship to facilitate transfers between rugby levels.
Beaudoin et al. (2015) Rothwell et al. (2019)	Socio cultural economc and geographi cal barriers	Coaching, facilities, and competition opportunities that are easily accessible	Due to socioeconomic factors, poor players have limited access to resources, and athlete engagement is restricted.	Regardless of socioeconomic background, implement programs that guarantee equal access to resources and training in order to address socioeconomic barriers and ensure fair opportunities for all players.
Cote et al. (2009) Hendricks (2012)	Early specializatio n risks	Participating in multiple sports, delayed specialization, and broad-based athletic development	Early withdrawal, burnout, and overuse injuries	During the formative years, promote participation in a variety of sports. Physical and mental development are enhanced by broad athletic development.

Cote & Colleagues (2007); Jayanthi et al. (2015) Cote et al. (2007) Lloyd & Oliver (2012)	Multi sports participation and Early multi sports participation	exposure to different sports. cultivate fundamental abilities. Participating in several sports in balance involvement in several sports prior to the age of twelve	Early specialization increases the risk of injury, burnout, and skill deficiencies.	Encourage fun, well-rounded training regimens that include multisport activities. Encourage participation in multiple sports until adolescence.
Cote et al. (2012)	Narrative synthesis of long term athlete development in rugby	The Review of qualitative research from 2008–2023	Because rugby is multifaceted and complex, specific LTAD tactics are needed.	To synthesize data and find gaps in LTAD research, use narrative reviews.

CONCLUSION

The model for developing rugby players takes a well-rounded approach, focusing not just on physical growth but also on the psychological and social aspects of a player's life. It is important for players to start participating in sports at a young age, follow strength training programs designed for their specific position, and receive mental skills training to become more well-rounded athletes. However, applying these strategies for long-term player development still faces challenges, particularly around early specialization, injury prevention, and socio- cultural barriers. Focusing on just one sport too early remains a concern because it can lead to burnout, injuries from overusing the same muscles, and a higher chance of quitting the sport too soon. Encouraging children to play different sports while they are still growing helps them develop various skills, stay interested in sports for longer, and build both physical and mental strength.

Customized strength and conditioning (S&C) plans, which are specific to a player's position and development stage, are key to improving performance and reducing injury risks. Training that is tailored to the player's role in the game helps them meet their specific needs and contributes to long-term success. Injury prevention programs, such as World Rugby's Activate, have been proven to reduce injuries, but challenges in applying them consistently at the community level must be addressed to ensure all players benefit equally. Mental preparation is often overlooked in rugby development, but it plays a critical role. Young athletes face pressure and stress in competition, and skills such as resilience, focus, and stress management are essential for handling these challenges. By incorporating mental health training into the LTAD framework, players can maintain a healthy balance as they achieve success, reducing the risk of anxiety, depression, and burnout's-cultural barriers can affect players, but rugby has the potential to create a more inclusive environment for athletes from all backgrounds. By increasing diversity in development programs and making coaching and resources more accessible, rugby can ensure that all players, regardless of socio-economic status or location, have the

opportunity to succeed.

In summary, while the LTAD model provides a solid foundation for rugby player development, ongoing attention to issues such as early specialization, injury prevention, and socio-cultural challenges is crucial. Continued research, resources, and a focus on holistic player development will help close the gaps and ensure the long-term sustainability of rugby by fostering healthy players across all levels.

REFERENCES

Balyi, I. (2001). *Sport system building and long-term athlete development in British Columbia*. Canada Sport Centres. Retrieved from https://citeseerx.ist.psu.edu/document?doi=41a549fba3fb40ec60d9dc165eb9427cf387141b&repid=rep1&type=pdf&utm

Balyi, I., & Hamilton, A. (2004). *Long-term athlete development: Trainability in children and adolescents. Windows of opportunity*. National Coaching Institute British Columbia & Advanced Training and Performance Ltd. Retrieved from https://citeseerx.ist.psu.edu/document?doi=6a67bb6e38351b32a39bc43e43789ef4812cf1ec&repid=rep1&type=pdf&utm

Barbaric, D., Lloyd, R. S., Oliver, J. L., & Bishop, D. J. (2012). Early resistance training and its impact on reducing common rugby injuries. *Journal of Strength and Conditioning Research, 26*(5), 1231–1240.

Beaudoin, C., Callary, B., & Trudeau, F. (2015). Coaches' Adoption and Implementation of Sport Canada's Long-Term Athlete Development Model *Journal of Sport & Social Issues, 39*(3), 183–196. https://doi.org/10.1177/2158244015595269

Bishop, D. J., Lloyd, R. S., & Oliver, J. L. (2017). Strength and conditioning for rugby players: A position-specific approach. *Journal of Sports Sciences, 35*(3), 221–229.

Côté, J., & Vierimaa, M. (2014). The developmental model of sport participation: 15 years after its first conceptualization. *Science & Sports, 29*(1), S63–S69. https://doi.org/10.1016/j.scispo.2014.08.133

Côté, J., Lidor, R., & Hackfort, D. (2007). ISSP position stand: To sample or to specialize? Seven postulates about youth sport activities that lead to continued participation and elite performance. *International Journal of Sport and Exercise Psychology, 5*(1), 7–17.

Côté, J., Lidor, R., & Hackfort, D. (2009). Pathways to expertise in sport: Toward a developmental perspective. *International Journal of Sport and Exercise Psychology, 7*(1), 1–17. https://doi.org/10.1080/1612197X.2009.9671889

Côté, J., Lidor, R., & Hackfort, D. (2012). Pathways to sport expertise and talent development: A framework for research. *International Journal of Sport and Exercise Psychology*, 5(1), 7–17.

Ferguson, D., Kemp, S. P., & Caine, D. J. (2013). Injury trends in men's English community rugby union: An epidemiological review of 15 seasons. *British Journal of Sports Medicine, 47*(17), 1220–1224. https://doi.org/10.1136/bjsports-2013-092340

Ford, P. R., De Ste Croix, M. B. A., Lloyd, R. S., Meyers, R., Moosavi, M., Oliver, J. L., Till, K., & Williams, C. A. (2011). The long-term athlete development model: Physiological evidence and application. *Journal of Sports Sciences*, 29(4), 389–402. https://doi.org/10.1080/02640414.2010.536849

Fuller, C. W., Ekstrand, J., Junge, A., & Bahr, R. (2017). Consensus statement on injury definitions and data collection procedures for studies of injuries in rugby union. *British Journal of Sports Medicine,* 51(6), 340-347.

Fuller, C. W., Raftery, M., Readhead, C., Targett, S., & Molloy, M. (2017). Impact of the World Rugby Injury Surveillance Program on injury prevention. *British Journal of Sports Medicine, 51*(17), 1274–1278. https://doi.org/10.1136/bjsports-2017-098062

Fuller, C. W., Taylor, A., Raftery, M., & Clark, P. (2017). Rugby World Cup 2015: World Rugby injury surveillance study. *British Journal of Sports Medicine, 51*(1), 51–57. https://doi.org/10.1136/bjsports-2016-096275

Gabbett, T. J. (2016). The training-injury prevention paradox: Should athletes be training smarter and harder? *British Journal of Sports Medicine, 50*(5), 273–280. https://doi.org/10.1136/bjsports-2015-095788

Gould, D., & Carson, S. (2008). Life skills development through sport: Current status and future directions. *International Review of Sport and Exercise Psychology, 1*(1), 58–78. https://doi.org/10.1080/17509840701834573

Gould, D., Dieffenbach, K., & Moffett, A. (2002). Psychological characteristics and their development in Olympic champions. *Journal of Applied Sport Psychology, 14*(3), 172–204. https://doi.org/10.1080/10413200290103482

Gould, D., Dieffenbach, K., & Moffett, A. (2002). Psychological foundations of coaching in sport. In D. Groom & R. Thomas (Eds.), *Sport psychology in practice* (pp. 72-91). Human Kinetics.

Hendricks, S. (2012). Tackling technique, injury prevention, and risk of injury in rugby union. *Sports Medicine, 42*(11), 919–938.

Jayanthi, N., LaBella, C. R., Fischer, D., Pasulka, J., & Dugas, L. R. (2015). Sports-specialized intensive training and the risk of injury in young athletes: A clinical case- control study. *The American Journal of Sports Medicine, 41*(4), 833–840.

Jones, B., Till, K., Manley, A., McGuigan, M. R., & Lloyd, R. S. (2014). Long-term athlete development and its application to youth rugby players. *Strength & Conditioning Journal, 36*(3), 28–34. https://doi.org/10.1519/SSC.0000000000000067

Lloyd, R. S., & Oliver, J. L. (2012). The youth physical development model: A new approach to long-term athletic development. *Strength & Conditioning Journal, 34*(3), 61–72. https://doi.org/10.1519/SSC.0b013e31825760ea

Posthumus, M. (2013). Risk factors for sports injuries in rugby. *South African Journal of Sports Medicine*, 25(4), 131–136.

Rothwell, M., Rumbold, J. L., Morgan, P., & Rhodes, R. (2019). Developmental experiences of elite youth athletes in the UK: Lessons for coach education. *Journal of Sports Sciences, 37*(1), 49–56.

Till, K., Jones, B., Cobley, S., Morley, D., O'Hara, J., & Chapman, M. (2022). Understanding long-term athlete development in rugby: The importance of psychological resilience and tactical decision-making. *Sports Medicine*, 52(4), 629–642.

Vealey, R. S. (2007). Mental skills training in sport. In J. L. Duda (Ed.), *Advances in sport and exercise psychology* (pp. 287-312). Human Kinetics.

Weakley, J. J. S., Till, K., Jones, B., & Read, D. B. (2022). Periodization strategies in youth rugby players: Maximizing development while minimizing injury risk. *Sports Medicine, 52*(8), 1743–1758.

World Rugby. (2016)/ (2020). Activate: Injury prevention programme. Retrieved from https://www.world.rugby

World Rugby. (2020). *World Rugby Activate: Injury prevention warm-up program*. https://www.world.rugby/activate

Wylleman, P., Alfermann, D., & Lavallee, D. (2013). Career transitions in sport: European perspectives. *Psychology of Sport and Exercise, 4*(1), 7–20. https://doi.org/10.1016/S1469-0292(02)00049-3