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**Investigating the English male rugby union talent system:  
Progression of players, effectiveness and efficiency of Premiership  
academies**

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A thesis submitted in fulfilment of the requirements for the degree of Doctor of  
Philosophy (PhD) at the School of Health and Human Performance, Dublin City  
University

December 2025

**Student Declaration**

I hereby certify that this material, which I now submit for assessment on the programme of study leading to the award of PhD is entirely my own work, and that I have exercised reasonable care to ensure that the work is original, and does not to the best of my knowledge breach any law of copyright, and has not been taken from the work of others save and to the extent that such work has been cited and acknowledged within the text of my work.

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## Acknowledgments

To my amazing supervisors Áine, Jamie, and Stephen, I honestly cannot thank you enough for the constant support, encouragement, and guidance you've given me over the past three years. You have each gone far beyond anything I could have hoped from supervisors, and I feel incredibly lucky to have learned from you. I am so grateful not only for your expertise, but also for your kindness, patience, and belief in me. Thank you for making this challenging journey not only possible, but thoroughly enjoyable.

To Neil, thank you for making this possible. I am truly grateful for your belief, advice, and encouragement throughout this process. Your mentorship has been invaluable, and I deeply appreciate both your guidance and support.

This research was co-funded by Premiership Rugby Limited. I am grateful for the support offered by this organisation. I would like to extend thanks and appreciation to Max, Lottie and Ben. To Max and Lottie, thank you for the countless hours you dedicated to collating the sheer volume of data. Your patience and persistence made an enormous contribution. To Ben, thank you for your support and for the thoughtful insights you offered to the research.

This research was also co-funded by Insight Centre for Data Analytics. I am appreciative for the support they have extended. To Michael, Vineet, and Asma, I am sincerely grateful for the generosity with which you shared your data science expertise. Your contributions have been fundamental in bringing this research to life, and I am truly grateful for the time, energy, and care you invested in this project.

To all the academy managers, coaches, and support staff, thank you for being so open, for sharing your insights, and for helping me get to grips with the world of rugby union. I am deeply thankful for all your contributions.

To my parents, Maureen and Simon, and brothers, Sam and Matthew, thank you for your unwavering love and support throughout all my pursuits. Your encouragement has meant everything during this experience. Reaching this point has been made possible by the foundations you have given me, and I am deeply grateful for the role you've played in helping me get here.

And finally, to my friends, thank you for keeping me balanced along the way. You constantly provided levity and perspective, reminding me that there's life outside of the PhD. Through your humour and encouragement, you have helped me maintain the resilience needed to see this through. I am grateful for all your support, I could not have done this without you.

I owe this thesis to all of you and the many others whose support, guidance, and encouragement have been invaluable. No one achieves anything alone, and I am deeply grateful to have had the support of so many people.

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## **Dissemination Publications**

Shelley, A., Taylor, J., MacNamara, Á., Sajwan, V., Scriney, M., McCarthy, N., Jones, B., Behan, S. (2025). The impact of high-potential status on progression and conversion within a male rugby union talent system. *Journal of Sports Sciences*, 43(4), 348–359. <https://doi.org/10.1080/02640414.2025.2458357>

### *Contribution:*

- a) Lead on study design and data analysis
- b) Lead on writing of study with collaboration from all authors

Shelley, A., MacNamara, Á., Behan, S., McCarthy, N., Jones, B., & Taylor, J. (2025). No solutions, only trade-offs: An exploration of contextual factors influencing rugby union talent development environments. *Journal of Sports Sciences*, 1–12. <https://doi.org/10.1080/02640414.2025.2486884>

### *Contribution:*

- a) Lead on study design, data collection, and data analysis
- b) Lead on writing of study with collaboration from all authors

Slaimi, A., Shelley, A., MacNamara, Á., Taylor, J., Behan, S., Scriney, M. Modelling Player Progression in Rugby Union: A Data-Driven Approach to Premiership Attainment. *In proceedings of the International Workshop of Sport Technology and Research*. In Press.

### *Contribution:*

- a) Collaborated on the data synthesis, analysis, and writing

## **Manuscripts under review**

Shelley, A., MacNamara, Á., Taylor, J., Scriney, M., McCarthy, N., Jones, B., Behan, S. *Bang for buck: Exploring associations between talent development environment resources and effectiveness in male rugby union*. [Under Review].

*Contribution:*

- a) Lead on study design and data analysis
- b) Lead on writing of study with collaboration from all authors

### **Presentations**

Shelley, A., Taylor, J., MacNamara, Á., Sajwan, V., Scriney, M., McCarthy, N., Jones, B., Behan, S. (2024, May 22). *The impact of high-potential status on progression and conversion within a male rugby union talent system* [Conference presentation]. All-Ireland Postgraduate Conference in Sport Sciences, Physical Activity & Education 2024, Galway, Ireland

Shelley, A., Taylor, J., MacNamara, Á., Sajwan, V., Scriney, M., McCarthy, N., Jones, B., & Behan, S. (2024, August 27). *The impact of high-potential status on progression and conversion within a male rugby union talent system* [Poster presentation]. Insight Centre for Data Analytics Annual Scientific Plenary 2024, Dublin, Ireland

Taylor J. & Shelley, A. (2025, May 9). *Problems to Solutions - Real world situations with academic answers* [Conference presentation]. DCU Elite Performance Student Conference, Dublin, Ireland

## List of Abbreviations

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Abbreviation	Definition
ACE	Academies, Colleges Education (RFU league for state schools)
BQ	Birth quartile; refers to relative age, BQ's are numbered 1-4 to represent relative age (BQ1 being relatively older than BQ4)
BUCs	British Universities and Colleges (Competition structure for higher-education providers; encompasses many sports, including rugby union)
DPP	Developing Player Programme
EAP	England Academy Player
J-EAP	Junior England Academy Player (subset of EAP; players nominated EAP $\leq$ U18)
S-EAP	Senior England Academy Player (subset of EAP; players nominated EAP $>$ U18)
IKT	Integrated knowledge translation
NGB	National Governing Body
PDG	Player Development Groups
PRL	Premiership Rugby Limited
RAE	Relative age effect
RFU	Rugby Football Union
TD	Talent development
TDE	Talent development environment

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## Commonly Used Terms

Term	Definition
Effectiveness	The capacity to achieve organisational goals (Madella et al., 2005). May be considered through the lens of outcomes (i.e., if goals are achieved), processes (i.e., how goals are achieved), or inputs (i.e., acquiring resources to achieve goals).
Efficiency	The balance between system inputs and system outputs (Madella et al., 2005).
Resources	Tangible (e.g., financial capital), intangible (e.g., time, culture), or human (e.g., attention, expertise) assets leveraged to achieve organisational objectives (Grant, 1999). Chapter 5 also refers to concurrent TDEs and talent pool as ‘contextual’ resources.
Conversion rate	A metric of efficiency; considers the proportion of athletes to progress between stages of a talent system.
Macro-level	Refers to the level of the talent system which influences system wide policies and practices (Taylor, MacNamara, et al., 2022); in this context RFU and PRL.
Meso-level	Refers to individual organisations working within the constraints of the macro-level of the talent system (Taylor, MacNamara, et al., 2022); in this context the Premiership clubs, and the academies.
Micro-level	Refers to the interactions between athletes and coaching/support staff operating within the talent system (Taylor, MacNamara, et al., 2022).
Coherence	The extent to which the various elements of an athlete’s experience across environments are mutually reinforcing (Taylor & Collins, 2022). May be considered vertically (i.e., long-term or between stages in a talent system), and horizontally (i.e., across a level of performance).
Integration	The extent to which the various inputs to the athlete are systematically combined to shape an athlete’s curriculum (Taylor & Collins, 2022). May be considered vertically (i.e., connected working practices through a sporting organisation), and horizontally (i.e., multiple stakeholders and the athlete working together across a level of performance).

## **Abstract**

**PhD Title:** Investigating the English Male Rugby Union Talent System: Progression of players, effectiveness and efficiency of Premiership academies

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To enhance the policies and practices which support talent development, there is a need to understand factors which influence strategic decision making, whilst also considering efficiency, effectiveness and resource implications. Adopting a pragmatic, mixed-methods approach, this thesis aims to investigate the male English rugby union talent system, investigating factors influencing Premiership player development with the intention to inform policy and practice. Chapter three presents a retrospective analysis of academy player conversion rate into the Premiership, considering differences between the fourteen academies and player sub-populations. Results highlight substantial differences between the academies, indicating highly differential effectiveness in the development of Premiership players. Aiming to explore these differences, Chapter four investigates how player development is influenced by contextual factors. Findings indicate that structural and organisational features, concurrent development environments, and resource constraints shape academy operations. There were strong perceptions that the schools and populations within each academy boundary influenced the academies' ability to develop players. As such, Chapter five quantitatively investigates the influence of resources (finances, staff, talent pool, and schools) on academy outcomes (number of Premiership players developed and number of appearances achieved). Results indicate that financial, school and population variables had little influence on academy outcomes, potentially indicating quality and strategic use of resources are more important than total resourcing. Finally, reflecting the need to consider processes of development, Chapter six presents a study exploring different successful routes through the talent system. Results indicate a player's position, relative age, academy, and Premiership club may influence how a player progresses to the Premiership. Overall, findings from this thesis reflect the complexity of talent development, and suggest a need to balance centralised control, academy autonomy, and resource allocation, while considering impact on players' developmental experiences

## **Chapter 1: Introduction**

There are growing calls for evidence-informed decision-making in sport. The goal of this approach is to empower knowledge users to make decisions that effectively support their objectives. To achieve this, research must be designed and conducted with a focus on real-world challenges faced by knowledge users. It should consider their specific contexts with the aim of identifying solutions. A key challenge in sport is talent development (TD), concerning the process and practices of supporting and promoting junior athletes towards future senior elite performance. TD is essential to the maintenance of high-performance sport and the sustainability of sport organisations (Martindale et al., 2005). Due to its central importance, many sport organisations have invested significant resources into establishing talent systems that provide structure to TD across a broad context and systematically prepares young athletes for senior high-performance. In the context of English rugby union, the ultimate aim is to develop players capable of competing for England at the highest levels of senior international rugby union. Current regulations, however, require England internationals to be contracted domestically with an English Premiership club. Consequently, the talent system must first develop junior players to enter the Premiership, the country's top-flight domestic league, as a necessary step toward international selection.

As with any talent system, a key challenge for TD in English rugby union is balancing the ideals of 'best practice' with practical realities, often shaped by resource and contextual constraints. This balance likely impacts the decisions made by the individuals, organisations, and policy makers operating in the talent system. In this sense, the notion of 'best practice' may be inherently challenged, as such attention might instead be best directed toward what achieves 'good enough' practice within a context. As such, it is important to understand how resource and contextual constraints shape TD decision making at each of these levels. What follows in this thesis is a highly contextualised investigation into English rugby union, considering factors affecting the

development of male Premiership players, with a view to informing the design and resourcing of the men's talent system.

## **1.1 English rugby union context**

Given the applied nature of this body of work, it is important to understand the context of English rugby union. Context is defined as the background or set of circumstances that surrounds an event or behaviour (Proeller, 2013). Understanding this context is essential, as the structure, culture, and policies of the sport directly influence TD. This section aims to give an overview of the talent system, highlighting relevant information to TD and for this thesis.

### ***1.1.1 Governance***

Player development within English rugby union is delivered through a collaboratively developed strategy between the national governing body (NGB), the Rugby Football Union (RFU), and Premiership Rugby Limited (PRL). Responsibilities of the RFU include the overall promotion of the sport, the development of the grassroots game, and the international teams. PRL represents the Premiership clubs and is 73% owned by the stake holding clubs, with the other 27% owned by the private equity firm CVC Capital Partners (Tyler-Todd & Zayed, 2022). PRL is responsible for the governance of England's elite domestic league, the 'Premiership'. Aligning the RFU and PRL is the Professional Game Plan, a mutually beneficial contract agreement between the stakeholding organisations (RFU, PRL, the Premiership Clubs, and the Rugby Players Association) to direct how the professional game is managed. In part, the Professional Game Plan provides the funding model to support the Premiership clubs in developing players capable of England international representation. The Professional Game Plan has shaped the operations of the talent system between the 2016/17 and 2023/24 seasons, set for renegotiation and reimplemention in the 2024/25 season.

PRL implements salary cap regulation, prescribing a maximum budget the Premiership clubs may spend on their senior men's team collective salary (Premiership Rugby Limited, n.d.). The objectives of the salary cap are to ensure the financial viability of the Premiership clubs and the league competition, to ensure fairness of spend between the Premiership clubs, to ensure a competitive league within the Premiership and in European competitions (e.g. Champions Cup), as well as to control inflationary pressures affecting costs (Premiership Rugby Limited, n.d.). These regulations incentivise clubs to develop players to meet the TD ambitions of the RFU and PRL by allowing clubs to gain additional 'credit' above the salary cap through the development and retention of 'homegrown players'. Homegrown players are players who were registered in the club's academy cohort at age-grade U18 and progress to become a contracted senior player with the club (Premiership Rugby Limited, 2023). As such, clubs may strategically use homegrown players to alleviate budget constraints when purchasing more expensive players. As they must retain and deploy these players to maintain the benefits of developing homegrown players, it is in the financial interests of the club to develop competitive homegrown players.

Over time, there have been variations in the structure of the Premiership league and academies. Former Premiership club Yorkshire Carnegie were relegated below the RFU Championship (tier 2 domestic league) in the 2019/20 season, reducing the Premiership from a 13 to a 12-team league. Yorkshire Carnegie's associated academy was re-established as a standalone organisation in 2020/21 (Yorkshire Academy). Since, Yorkshire Academy has only operated as a junior academy (U16-U18), is not affiliated to a senior club of any competitive standard and is currently managed by the RFU. In 2022/23, three Premiership clubs became insolvent (Wasps, Worcester Warriors, and London Irish), further reducing the Premiership to a ten-team league. The academies associated with these clubs were also taken over by the RFU to complete the 2022/23 and 2023/24 seasons, after which they were disbanded. Otherwise, due to COVID-19, promotion and relegation were

suspended, and since the 2020/21 season the Premiership has operated as a fixed-team league. These structural and organisational changes to the Premiership highlight the instability of professional sport, with knock-on effects to TD.

### 1.1.2 English rugby union talent development

#### 1.1.2.1 Talent system design

The English rugby union talent system, managed by the RFU and PRL, aims to develop junior players towards senior elite domestic and international competition. TD is delivered through an academy system. Currently, there are ten academies integrated with Premiership clubs and one other run by the RFU. Over the span of this project, this number has fluctuated between fourteen and ten. Each academy has a geographical region of England they may operate within, limiting academies to identify, select and develop players within their designated region. Players are assigned to a region based on either their home address, their school address, or their registered local club address (if aged above U13). Figure 1.1 depicts the 2016-2024 regional boundaries, divided between 14 academies (prior to club insolvency).

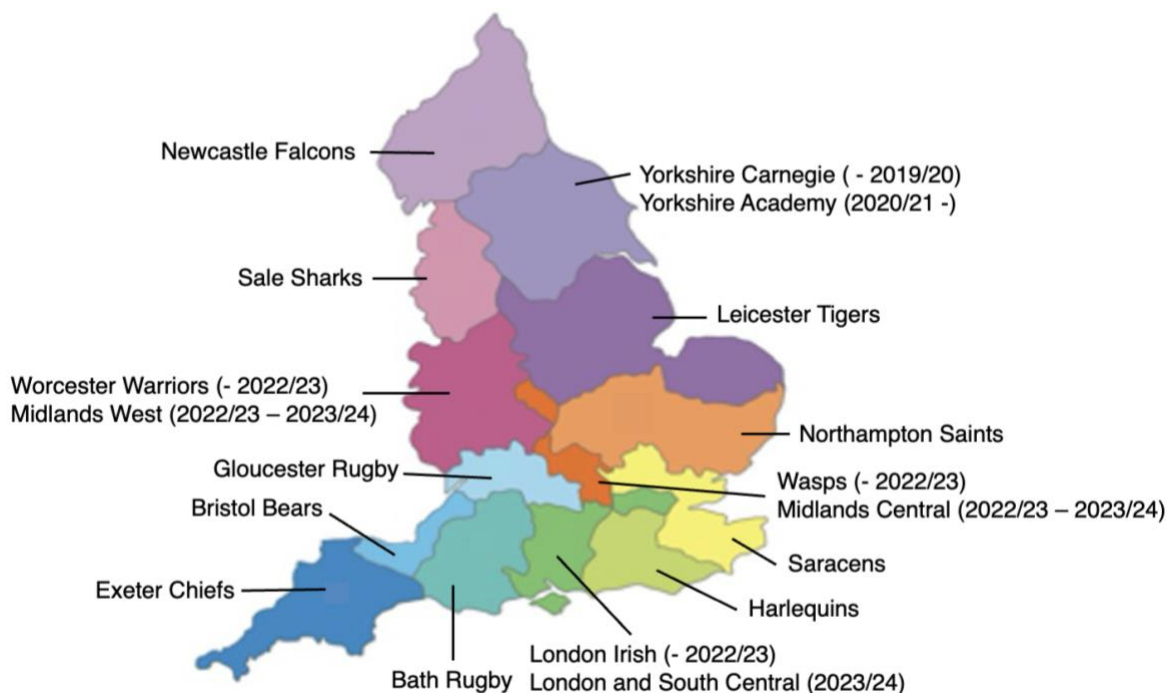


Figure 1.1 2016 - 2024 geographical academy boundaries

Rugby union has been described to be ‘an early engagement, but late specialisation sport’ (Till et al., 2020, para. 3) with recommendations that talent identification and selection should be delayed until after maturation (Rugby Football Union, 2013; Till et al., 2020). As such, the English rugby union talent system has been designed to have both ‘wide and emergent’ and ‘narrow and focused’ player pathways, following an age-grade structure. The aim of this dual model is to engage and provide appropriate opportunities to a greater number of players, to provide some flexibility for players to develop at different rates, and to account for potential differences in player maturation.

The talent system can be divided into three phases (Figure 1.2). The Developing Players Programme (DPP) is a ‘pre-academy’ programme aiming to supplement the development of the top 10% of rugby union players aged 14-16 within each region (Hall et al., 2024). Players are nominated to DPP by their school or local club. Because DPP is a part-time programme, with players engaged in training once a month, players are expected to be regularly engaged with their local club and/or school rugby. Funding of the programme is supplemented by the RFU and delivered through regional academies. DPP also provides longitudinal talent identification opportunities, with the academies utilising DPP to source players for the next stage of the system. Prior to DPP, players are typically involved in local youth and junior rugby programmes provided by community club and/or school rugby, starting as early as U7 in the format of ‘tag-rugby’, with contact rugby union starting from U9 (Rugby Football Union, 2025). As such, whilst development opportunities may begin from U7, selection into the talent system may not occur until U16, aligning with recommendations of delaying talent identification and selection (Till et al., 2020).

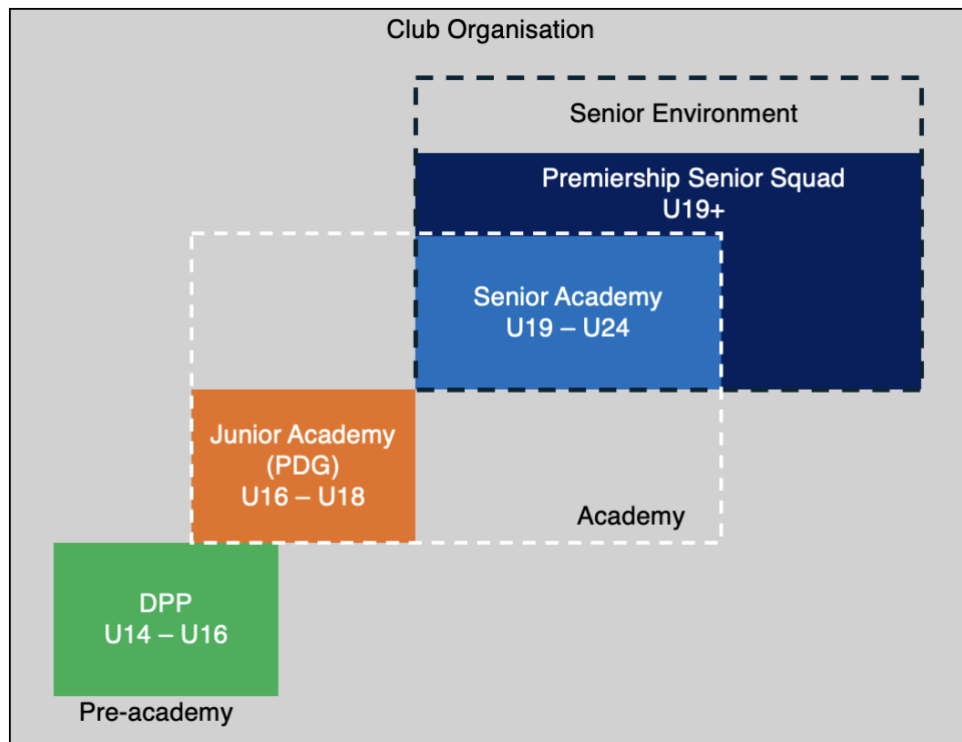


Figure 1.2 English rugby union talent system stages nested within a Premiership club organisation

At age-grade U16, players are eligible to be selected into Player Development Groups (PDG), also known as the junior academy. The junior academy consists of age-grades U16 to U18, with development opportunities offered to circa 30-40 players per age-grade. Operating on a part-time basis, players engage in training and other development opportunities one to three times per week depending on age-grade and stage of the season (Till et al., 2020). In the junior academy, players receive coaching, strength and conditioning, performance analysis, and physiotherapy support. As for competitive opportunities, U16 and U17 players engage in a two-day inter-academy competitive festival once per season, whereas U18 players engage in the U18 academy league, consisting of six match fixtures across the season.

To continue their development with an academy post-U18, junior academy players need to achieve a senior academy contract. Although the exact number of senior academy contracts offered varies

between academies and cohorts, the ratio of U18 players to available senior academy spots typically results in a steep selection process. The senior academy aims to assist the transition between junior academy and the first team squad (Till et al., 2020). A player is considered an academy player up until the age of 24 or until their total salary for any Salary Cap year exceeds £50,000 (Premiership Rugby Limited, 2023). Typically, post-U18, players entering the senior academy will be awarded a two-year contract. Development opportunities of the senior academy include individualised development plans, full time training alongside the senior team, and opportunities to be loaned to lower league clubs (e.g., RFU Championship, National League One and National League Two) to increase their playing time.

An important feature of the English rugby union talent system is the ‘England Academy Player’ (EAP) scheme. EAPs are England eligible players perceived to have the greatest potential to progress and become senior elite players. To support these high-potential players’ development and progression, it is mandated by the RFU that EAPs should receive individualised development plans, enhanced medical insurance, and carefully managed match playing schedules. It is also mandated by the RFU that academies should provide evidence of communication between all player stakeholders (i.e., parents, school, local rugby club) to ensure communication and coordination. England Rugby, the organisation responsible for the international teams (senior and age-grade), become stakeholders in EAP development, providing additional support, training and age-grade international match opportunities. In essence, alongside this additional support, ‘EAP’ becomes a status symbol, explicitly communicating the academy’s perception of ‘high potential’ to the players’ peers and stakeholders.

A player may become an EAP in one of two ways. In the junior academy, a player becomes an EAP through academy nomination. Typically, only a small proportion of each age-grade cohort are

nominated; all EAPs are junior academy (PDG) players, but not all junior academy players are EAPs. As such, there are disparities between the level of support provided to each player in the junior academy dependent upon EAP status. With no guidelines on what constitutes an EAP other than “those who demonstrate the greatest potential for progression to professional and representative rugby and are the ‘best of the best’ players in the system” (Till et al., 2020, p. 177), each academy set their own EAP selection criteria. Otherwise, all players entering the senior academy automatically become an EAP if England eligible, meaning players without prior EAP status may become an EAP if awarded a senior contract. However, other than involvement with England Rugby, there is little difference in provision between EAPs and non-EAPs in the senior academy.

#### *1.1.2.2 Concurrent environments*

In the context of English rugby union TD, as well as considering the role of the governing organisations, academies, and Premiership clubs, it is also important to consider additional stakeholders in player development. Across the entirety of the talent system, players may interact with other rugby union environments that contribute to development (Figure 1.3). As DPP programme is designed to supplement development, in this stage, players’ main source rugby is through local rugby clubs and, potentially, their school. Whilst in the junior academy, players commonly still play local club or school rugby alongside the academy. The balance between school, local club, and academy rugby depends on the stage of the season and the availability of this additional provision to players. Otherwise in the senior academy, to supplement their development, players may be loaned to lower league clubs competing in the RFU Championship and National Leagues. However, in some cases, senior academy players may concurrently be enrolled at a university and supplement their development with university rugby programmes rather than loan clubs.

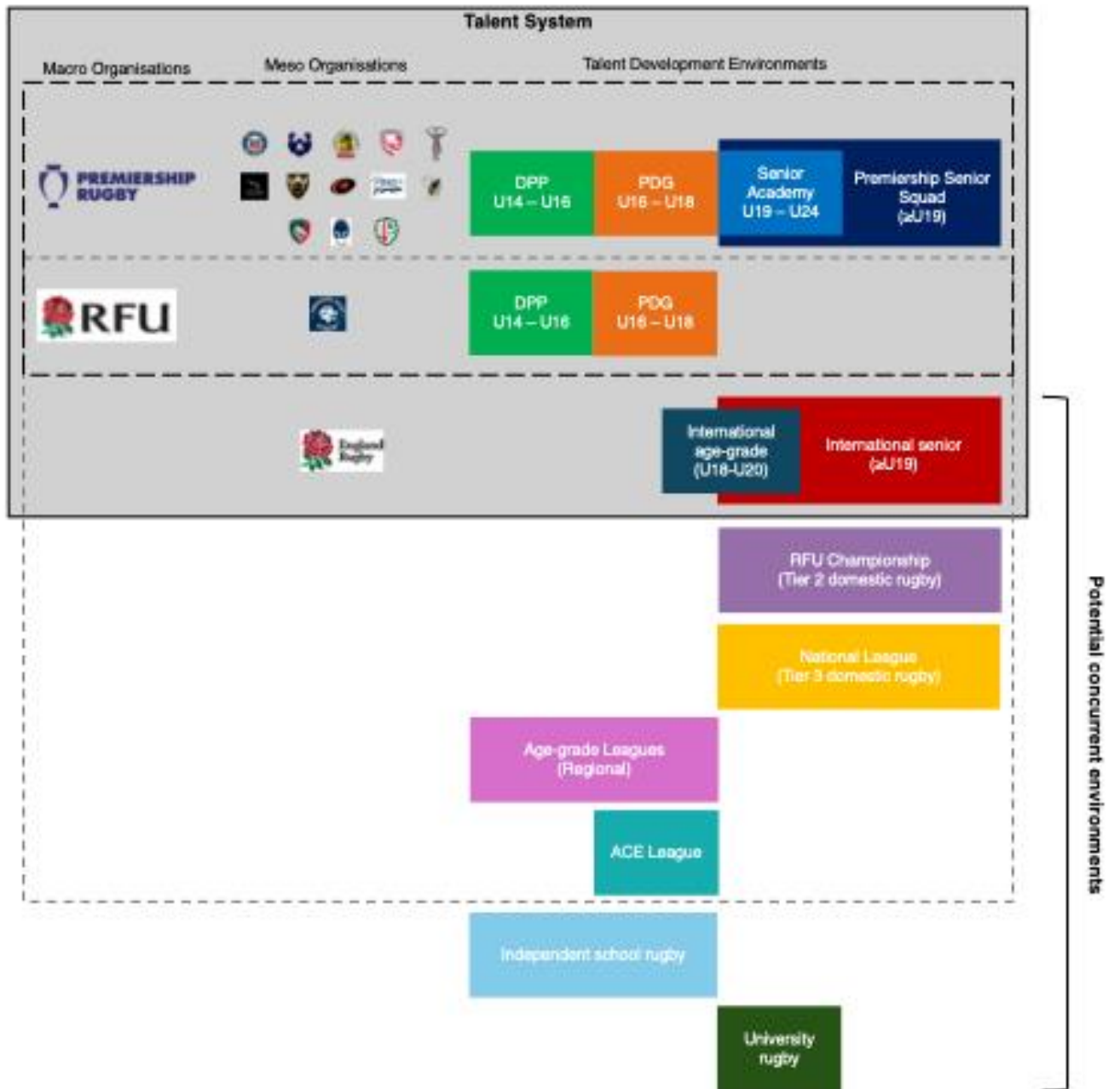


Figure 1.3 English rugby union talent system structure and potential concurrent environments

There is considerable discourse of the role schools in sport talent development, including rugby union. Broadly, British secondary and further education establishments can be divided between ‘state’ and ‘independent’ schools. State schools are government funded, free-to-attend institutions. Independent schools are institutions funded by admission fees and private donations and are not controlled by the government. Research from the Sutton Trust (2019) has indicated that there is an

overrepresentation of independently educated British male and female athletes competing at the senior elite level. For example, 30% of British medal winners at the 2016 Olympic games were independently educated compared to 7% of the general population (Sutton Trust, 2019). In rugby union, 25% of the English 2019 Six Nations squad were reported to be independently educated (Sutton Trust, 2019). The overrepresentation of independently educated athletes has previously been hailed as ‘one of the worst statistics in British sport’ (BBC News, 2012). However, it is important to note that it is unreported whether this overrepresentation could be skewed by high-potential young athletes being offered independent school opportunities because of their athletic ability, rather than their high-potential being a result of independent school involvement.

Broadly speaking, across a range of sports, there is disparity in the level of sport provision between state and independent schools (Morton, 2022). Specifically in the context of English rugby union, independent schools have their own competitions, running between September-December annually, competing one to three times per week (Phibbs, Jones, Roe, et al., 2018b). In this sense, academy players who attend an independent school may have more opportunities to train and compete. Whilst many state schools offer rugby union as part of the physical education curriculum (White et al., 2022), specific rugby union provision is not offered to the same extent as independent schools. Aiming to bridge the gap, under current RFU regulation, each academy must have a partnership with at least one state school within their boundary, with these schools competing against each other in the ‘Academy, Colleges and Education’ (ACE) league. The RFU and PRL have organised the annual junior competition calendar to accommodate the state and independent school competition schedule.

### ***1.1.3 English rugby union talent development tensions***

In 2013, the RFU held a world-first talent symposium at the Royal Society (an independent scientific academy of the UK) to discuss the challenges of rugby union TD and reach a consensus statement (Rugby Football Union, 2013). Discussions emphasised the need for a clear and flexible player development system, with a pressing need for more rugby-specific, longitudinal data to inform evidence-based practices and policies (Rugby Football Union, 2013). In 2022, nearly ten years on from this symposium, with the Professional Game Plan due for renewal in 2024, PRL and RFU began to consider the renegotiations of the agreement. However, despite specific calls for further research at the 2013 symposium, no systematic approach had been undertaken. As a consequence, the potential research available to inform the strategic direction of the game had considered single academy contexts (e.g., Dimundo, Cole, Blagrove, McAuley, Till, Hall, et al., 2021; Dimundo, Cole, Blagrove, McAuley, Till, & Kelly, 2021; Dimundo et al., 2022; Jones et al., 2018; Owen et al., 2022; Phibbs et al., 2017, 2018b, 2018a; Read et al., 2017, 2019, 2019; Winn et al., 2017). Whilst some research has covered multiple academy contexts (e.g., Owen et al., 2022) individual academies are seldom compared and contrasted.

The research focus has also seemed largely confined to the physical characteristics of players (Darrall-Jones et al., 2015, 2016; den Hollander et al., 2023; Fontana et al., 2016; Hamlin et al., 2021; Lombard et al., 2015; Parsonage et al., 2014; Wood et al., 2018; Zabaloy, Gálvez González, et al., 2022), and match play (Hartwig et al., 2008, 2009, 2011; Hendricks et al., 2019; Jones et al., 2018; Phibbs et al., 2017; Phibbs, Jones, Roe, et al., 2018a, 2018b; Read et al., 2017, 2019). Whilst research is starting to move beyond this (e.g., Dimundo, Cole, Blagrove, McAuley, Till, & Kelly, 2021; Dimundo et al., 2022; Hall et al., 2024; McCarthy & Collins, 2014; Moodie et al., 2023; Taylor, Collins, et al., 2022; Winn et al., 2017), there is little to no research considering the systemic factors influencing TD in the English rugby union context. This, combined with the limited sample

sizes, single academy contexts, and lack of longitudinal data, may present challenges to informing policy decision making. Whilst much of the research has focused on the players in the talent system, the talent system itself and its guiding policies are likely to be a key contributor to successful TD (cf. De Bosscher et al., 2009). As such, to inform policy and practice in this context, research needs to consider the whole talent system and investigate previous guiding policies utilising longitudinal data.

Contributing to the challenges of TD in this context, several persistent narratives influence rugby union practitioners' TD perspectives and practices which are not currently grounded in research. One such narrative is that rugby union is a 'late maturation' sport. Practitioners frequently use this term to suggest that player selection, development, and greater individualised investment should be delayed until after maturation. This potentially maladaptive narrative likely stems from a misinterpretation of the Royal Society's consensus statement which suggests final selection should not occur until post-maturation (Rugby Football Union, 2013). Delaying final selection until after maturation aims to allow players to develop at different rates. As such, there would seem to be some ambiguity in the interpretation and application of this consensus statement in practice.

A second strong and persistent narrative influencing both practice and external perceptions of the sport concerns the role of schools in rugby player development. It is widely perceived that schools strongly influence development, and that the quality and proximity of rugby playing schools to an academy significantly impact the academy's ability to develop Premiership-level players. Narratives in the media feed into this perception (e.g., Morgan, 2025), and previous research from the Sutton Trust (2019) has suggested that many professional British rugby union players attended independent schools. Whilst comparisons between school and academy rugby have been made

(Jones et al., 2018; Read et al., 2018), research is yet to consider the impact of a player's school on development.

In this sense, there are potentially significant factors influencing player development and resource investment in this context which are currently not addressed by research. With the Professional Game Plan between PRL and RFU due for renewal 2024/25, there was opportunity to renegotiate policies influencing TD. Given the limitations of the current body of literature previously highlighted, PRL recognised the opportunity to support and contribute to research designed to inform policy, practice, and resource allocation. Most particularly, the focus was on the developmental impact of historic practices of the talent system and investigate how it has impacted Premiership player development.

## **1.2 Research considerations**

### ***1.2.1 My context and positioning***

Prior to undertaking this PhD project, I had limited knowledge of or experience of rugby union. This positioned me as an outsider to the cultural and operational contexts of the sport, someone not embedded within its coaching practices, organisational structures, or informal networks (Braun & Clarke, 2013). While this may create a sense of distance from the field, outsider status can offer distinct epistemological advantages. As others have noted, researchers who are not integrated into the setting under study may bring a critical lens and question taken-for-granted assumptions (Dwyer & Buckle, 2009; Merton, 1972)

Recognising the importance of understanding the context from the perspective of those within it, I actively engaged with key stakeholders throughout the research process. This included ongoing

conversations with policymakers, practitioners, players and their parents. I also observed multiple academy training sessions across a range of age-grades, as well as senior team training sessions, with several Premiership clubs, and attended multiple academy league fixtures. This enabled me to better understand how the sport was coached across the stages of the talent system and appreciate the variability between club organisations. I also visited school rugby training sessions and visited a Premier League soccer academy to contrast what I was observing in the Premiership academies.

Through this engagement I was able to understand some of the challenges of developing rugby union players in this context and appreciate what was important to practitioners. As the project progressed, I frequently presented research findings from the thesis to policy makers and practitioners to engage them in the research process and understand their perspectives. These interactions helped me to understand the sport, the talent system, and the diversity of the context, enabling me to design research and interpret findings with greater contextual sensitivity.

My positioning was central to how I approached the analysis and interpretation of data. On one hand, my outsider's perspective enabled a critical examination of the structures and narratives that underpin the talent system. On the other hand, sustained dialogue and relationship-building ensured the research remained grounded in the lived experiences of stakeholders and responsive to the complexities of practice.

### ***1.2.2 Philosophical positioning***

When reflecting on the methodology and findings of this thesis, it is important to situate them within my own philosophical positioning. This positioning can be understood as the underlying set of beliefs that guide actions and interpretations (Creswell & Creswell, 2018). In clarifying such a stance, it is necessary to consider both ontology, the assumptions about the nature of reality, and

epistemology, assumptions about how knowledge is generated and applied (Frankel Pratt, 2016). Philosophical positioning shapes how researchers choose the questions they investigate and the methods they employ to explore them (Morgan, 2007). In this sense, research methodology is reflective of the researcher's interpretation of reality, their commitment to a version of reality, and their assumptions about how knowledge can best be generated (Frankel Pratt, 2016).

This thesis has adopted a pragmatic stance, falling between positivist and constructivist paradigms (Martela, 2015). Pragmatism rejects the notion that knowledge is either objective and universal (positivist), or entirely subjective (constructivist). Dewey (1938) argued that inquiry should focus on understanding the consequences of actions and producing knowledge that is practically useful, rather than seeking absolute truths, whilst adhering to the rigour of empirical inquiry. As such, pragmatism emphasises pursuing lines of inquiry whose outcomes inform our actions. Consequently, pragmatic researchers focus on the practical consequences of their investigations (James, 1907). In line with not seeking absolute truths, pragmatism emphasises our understanding of how 'real-world' processes operate in an applied context (Kaushik & Walsh, 2019). Within this paradigm, knowledge is considered provisional, fallible, and open to revision in light of new experiences (Frankel Pratt, 2016).

In terms of ontology, pragmatism is not committed to any single version of reality (Weaver, 2018), rather, reality is actively generated as individuals experience the world (Gillespie et al., 2024; Kaushik & Walsh, 2019). In this sense, under pragmatism, reality is ever changing based upon human experience and orientated towards solving practical problems (Weaver, 2018). From an epistemological perspective, pragmatism views knowledge as being contextual, evolving, and assessed by its usefulness in addressing real-world problems (Kaushik & Walsh, 2019; King, 2022). This means that research methods should be selected based on their ability to best answer

the research questions at hand and thus are contextually driven. Pragmatic epistemology emphasises the process of inquiry, concerned with the constant pursuit and evaluation of knowledge, rather than treating knowledge as the end-point of human thought (Legg & Hookway, 2008). Under pragmatism, epistemological truths depend on long-term reliability resultant of careful inquiry (Capps, 2024).

A pragmatist approach to research argues that qualitative and quantitative methods can and should be combined to add both depth and breadth to research, thus improving its rigour (Gillespie et al., 2024). In the context of this thesis, in aiming to understand the impact of historic practices on the efficiency and effectiveness of the talent system, a purely quantitative or qualitative approach would have been inadequate to inform future practice and policy decision making. Consequently, this thesis has implemented a mixed-methods research design, combining the strengths of quantitative and qualitative research methods to comprehensively investigate research questions. This integration reflects the pragmatic commitment to producing knowledge that is both credible and actionable. Chapters 3, 5 and 6 utilised quantitative methodology to investigate the potential impact of policy, resources, and talent system design on the development of Premiership players, whereas Chapter 4 utilised qualitative methodology to explore the findings from those studies with practitioners working across the talent system.

### ***1.2.3 Co-produced research***

In sport research contexts, there is an increasing call for research to be designed with practitioners, to engage with non-academic partners to help shape and contribute to scientific inquiry. It is thought that engaging with non-academic individuals embedded in the investigated context may help to increase the practical impact of the research (Smith et al., 2023). Co-production offers a research approach that operationalises pragmatic research philosophy by involving stakeholders as active

partners in the research process, allowing those actively involved in the researched context to identify the key real-world challenges that need solutions. Given my outsider's perspective, this engagement with stakeholders was appropriate to ensure the research was grounded in the practical realities of the English rugby union context, and that the generation of findings were both credible and actionable.

Specifically, this thesis adopted integrated knowledge translation (IKT) approach to co-production (Smith et al., 2023). IKT is defined as a collaborative process in which researchers work with knowledge users (e.g., English rugby union policy makers, coaches, and sport science practitioners) in all parts in the research process. This entails knowledge users' involvement in shaping research questions and implementing research findings, aiming to make the research more impactful (Graham et al., 2019; Kothari et al., 2017). The initial research questions were initially developed via extensive discussions between myself and my supervisors. These research questions were subsequently co-produced through discussions with PRL's head of talent development. To further engage with key stakeholders, research plans and progress were presented to a steering group committee. The purpose of this committee was to contribute to, and critique intended research plans, share research findings, and discuss impact and dissemination of the research. These steering group committee meetings featured individuals representing PRL, RFU, and the academies, as well as individuals from independent non-rugby union organisations. Their professional insights were central to shaping the project. These steering group meetings facilitated the IKT process and contributed to keeping the research grounded in the investigated context, allowed formal opportunity for stakeholders to shape research, and encouraged accountability and transparency. With PRL funding this research project whilst engaged in Professional Game Plan negotiations with the RFU, transparency in all aspects of the research was important to limit any potential or perceived biases through PRL's central involvement.

Otherwise, throughout the project, I sought to formally and informally engage with practitioners who have valuable insights, and influence to use and implement research findings (Smith et al., 2023). This was achieved through informal conversations with practitioners at academy training sessions, and more formal exchanges through project dissemination opportunities provided by PRL at academy management meetings and during research data collection (see Chapter 4).

#### ***1.2.4 Data***

To support the aims of the project and as part of the collaborative research process, PRL shared 18 longitudinal datasets. Datasets included the compilation of junior academy (PDG) registration and release lists, EAP registration and release lists, and club registration lists. The purpose of registration lists is to notify RFU and PRL of the players associated with the academy and club organisations and provide basic information. Otherwise release lists inform RFU and PRL of the players leaving the academy. PRL sourced additional data from a third-party statistics company, including a detailed dataset of match appearances of ex-academy players in domestic competitions. PRL also provided the annual academy audits, a document each academy submit each year providing information of their financial spending. All datasets were anonymised by PRL. Each academy/club and individual players were given an anonymous ID. Datasets were combined through the anonymisation codes with the assistance of Insight Research Ireland Centre for Data Analytics, who co-funded this project. In total, the datasets included data pertaining to 11,341 players, with the largest dataset spanning back to 1998, and included all information ever centrally collected by PRL. A summary of the core datasets used in this project are included in Table 1.1.

*Table 1.1 Summary of core datasets utilised in this thesis*

Dataset	Time span	Unique Players (N=)	Contents
PDG Registration Lists	2010/11 - 2022/23	6038	Player anonymous ID, academy, date of birth, position, school/education, age of first contact, age grade for season
PDG Release Lists	2011/12 - 2022/23	1626	Player anonymous ID, academy, date of birth, current age-grade, position, destination
EAP Registration Lists	2010/11 - 2022/23	1963	Player anonymous ID, academy, date of birth, school/education, position, additional nation eligibility status, additional eligible nation
EAP Release Lists	2010/11 - 2022/23	907	Player anonymous ID, academy, date of birth, destination
Club Registration Lists	2016/17 - 2022/23	1940	Player anonymous ID, club, date of birth, position, dual registration, contract start date, contract end date, EAP status, England qualified player status
Match Dataset	1998/99 - 2023/24	5133	Player anonymous ID, club, match date, opponent, tournament, match statistics, shirt number
Academy Audits	2012/13 - 2023/24	-	Annual financial spending in 'Player', 'Programme' and 'Staff' cost centres
Staff numbers	2017/18 - 2022/23	-	Number of staff employed in various coaching and support roles at each academy

However, despite the substantial data available to this project, the data availability were inconsistent. This was particularly the case with player registration lists. Table 1.2 shows an example of this; 121 of 182 possible PDG registration lists were available for analysis, with only one academy having a full set, due to missing registration lists in the PRL and RFU data archives. Importantly, at the point of data collection, there was no intention that the registration or release lists would be analysed. A consequence of this being significant time and effort being devoted to standardising the datasets, taking nine months of cleaning and synthesis to make the data useable. Within the registration and release datasets, substantial player data had not been collected. PDG registration lists asked academies to provide information regarding the player's date of birth, school, position, age of initial selection. However, providing this information was not made mandatory and data entry fields were not standardised, meaning there was an unequal level of data available for each player. The standard of data available within PDG registration lists deviated significantly both between and within academy organisations over time.

Comparatively, the data available via EAP registration lists was significantly more complete due to these registration lists being closely monitored by the RFU, with only one missing registration list (Club E, 2018/19). EAP registration lists requested academies provided information regarding the player's date of birth, school, place of birth, position, dual nation eligibility status, and whether the academy intended to provide an individualised development plan. However, it would seem that not all fields were mandatory, and completeness of player data significantly deviated depending on academy organisation.

Table 1.2 Flags indicating whether PDG registration list was available for each academy in each included season (1 = available, 0 = non-available)

	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23	Total
Club A	1	1	1	0	1	1	1	1	1	1	1	1	1	12
Club B	0	1	1	0	1	1	1	1	1	1	1	1	1	11
Club C	1	1	1	0	0	0	0	1	1	1	1	1	1	9
Club D	1	1	1	0	0	0	1	0	1	1	1	1	1	9
Club E	1	1	1	0	0	0	0	1	0	1	1	1	1	8
Club F	1	1	1	0	0	0	0	0	0	1	0	1	1	6
Club G	1	1	1	0	0	0	0	0	0	1	1	1	1	7
Club H	1	1	1	0	1	1	1	1	1	1	1	1	1	12
Club I	1	1	1	0	0	0	0	0	1	1	1	1	0	7
Club J	1	1	1	0	0	0	0	0	0	1	1	1	1	7
Club K	1	1	1	1	1	1	1	1	1	1	1	1	1	13
Club L	0	1	1	0	0	0	0	1	1	0	1	1	1	7
Club M	1	1	1	0	0	0	0	0	0	1	1	1	1	7
Club N	1	1	1	0	0	0	0	0	0	1	1	0	1	6
Total	12	14	14	1	4	4	5	7	8	13	13	13	13	121

The data availability constrained the research questions asked, which players were included in analyses, and present limitations for the quantitative studies. For example, the high availability of seasonal EAP data shaped the direction of the studies presented in chapters 3 and 6, whilst the lack of PDG data limited academy comparisons to EAP data. How the data availability impacted each quantitative study is highlighted in each respective chapter.

### 1.2.5 Methodological considerations

Combined with the strong support from PRL, RFU, and the Premiership club organisations, this project had unprecedented access to a breadth of information. As such, this thesis presents a comprehensive single talent system investigation and, to my knowledge, the first conducted in rugby union. Consequently, the richness and scope of the data offered numerous potential lines of enquiry. Aligned with my pragmatic philosophical orientation, and the thesis aim of generating

practically useful knowledge, potential research questions were initially developed through extensive discussions with my supervisors and then subsequently coproduced through discussions with the PRL's head of talent development. To further embed this commitment to coproduction, a steering group was established, comprising key stakeholders whose diverse perspectives and professional insights were integral to shaping the project's direction and implementation. This collaborative approach ensured that the design and objectives were informed both by academic oversight and by sector-specific expertise. To refine potential research questions, two guiding questions were applied: a) to what extent would addressing this question inform English rugby union talent development policy and practice, and b) to what extent would it contribute to broader talent development literature and practice? Given the novelty of the project, the scale of the data and its condition, research questions were prioritised according to their practical actionability, and their potential to open further avenues of investigation. This section of the thesis aims to give a broad overview of the methodological considerations that have guided the chosen research approaches.

#### *1.2.5.1 Scale and timeframe*

This thesis has been significantly strengthened by access to a substantial body of data, comprising 18 discrete datasets collated and shared by PRL. Collectively, these datasets encompass information relating to 11,341 players, thereby offering both a large sample size and a robust empirical foundation for analysis. As indicated in Table 1.1, the temporal breadth of the data is considerable, with some datasets extending as far back as the 1998/99 season, with most datasets offering more contemporary data from 2010/11 season onwards. This longitudinal dimension not only enhances the richness of the dataset but also provides valuable opportunities for examining patterns and trends over an extended period of time and against developments in the structure of the professional game.

The longitudinal nature of the data necessitated that potential research questions were carefully aligned with the availability and context of the data. For example, whilst I had access to match data pertaining to the 1998/99 season, it is important to recognise that the competitive and organisational landscape of English rugby union was markedly different at this time compared to the more contemporary data available. Specifically, the 1998/99 season coincided with the professionalisation of rugby in England, and the academy system, a central and contemporary feature of the current landscape, had yet to be established. As a result, data from this earlier period were valuable in terms of evidencing historical transitions in the system but offers limited applicability to PRL's contemporary strategic concerns such as their renegotiation of the Professional Game Plan in 2024/25.

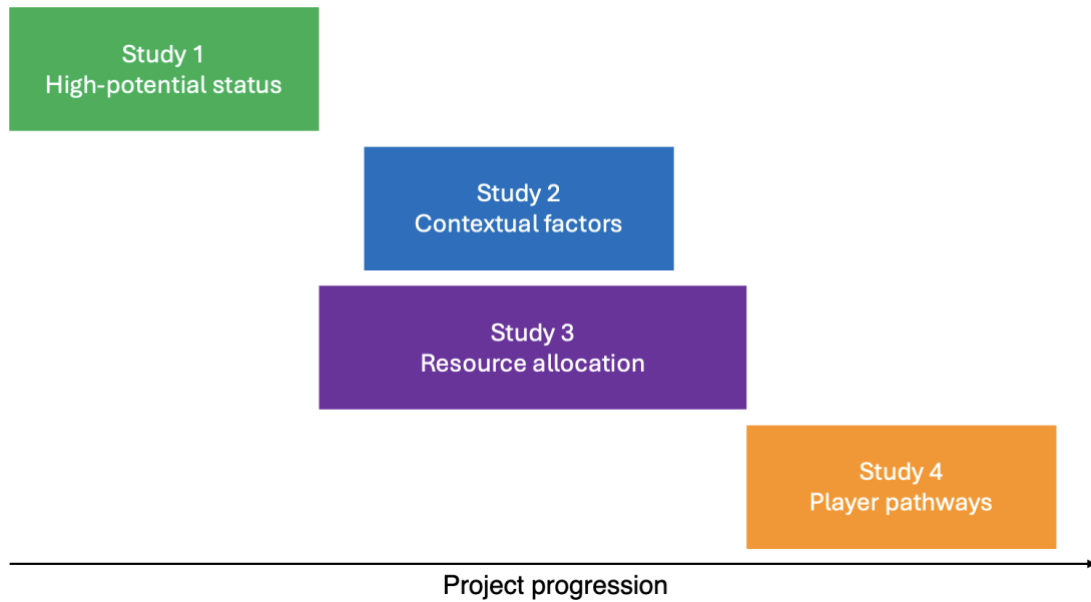
A novel aspect of this thesis lies in the integration of multiple large-scale datasets to enable the investigation of complex research questions. As one consideration, it was important to account for the temporal overlap and discontinuities between datasets. Accordingly, all analyses presented in this thesis consider data from 2012/13 onwards. This starting point was specifically chosen due to its contextual alignment with the implementation of key talent system policies, most notably the EAP policy introduced in the 2010/11 season. During the first two seasons of this policy, 2010/11 and 2011/12 seasons, established Premiership players falling within the age cut-off (U16-U24) were retrospectively nominated as EAPs. As such, EAP status during this period was not reflective of developmental progression and resulted in significantly higher nomination rates relative to subsequent seasons. To mitigate the influence of these outliers, these first two seasons were excluded from the analyses.

By adopting the 2012/13 season as a baseline, and with the match dataset subsequently updated on an annual basis, this thesis was able to generate a retrospective analysis spanning up to 13 years.

Importantly, the novelty of this approach is not only in the scale and longitudinal depth of the data but also in its flexibility across different research questions. The different aims of the chapters necessitated distinct analytical windows. For example, Chapter 3 was conducted earlier in the project and encompassed a 10-year retrospective analysis whereas Chapter 5, drawing on the more recently available Academy Audit data, was limited to an eight-year retrospective. This adaptive use of longitudinal data underscores the originality of the research design and strengthens the contribution of the thesis to both academic and applied understanding of talent development in rugby union.

#### *1.2.5.2 Mixed-method design*

Aligned with my pragmatic research philosophy, which encourages seeking research methods best positioned to answer research questions (Gillespie et al., 2024), this thesis adopted a multi-methods approach to understand factors influencing the efficiency and effectiveness of the English rugby union talent system. Pragmatism prioritises research designs that are best positioned to address the research questions, rather than adhering rigidly to epistemological commitments (Gillespie et al., 2024; Legg & Hookway, 2008). Whereas positivism asserts that objective knowledge can be generated through empirical testing, and constructivism emphasises the contextual and socially constructed nature of knowledge, pragmatism recognises knowledge as a continuum that accommodates both objective and subjective insights (Kaushik & Walsh, 2019). This position afforded a more flexible and reflexive approach to research design, enabling methods to be adapted to the complexity of the phenomena under investigation (Morgan, 2007). Mixed-method approaches are aligned to this position as they allow multiple approaches to be combined in addressing multifaceted research questions (Bryman, 2006b).



*Figure 1.4 Sequence of data collection and analysis of thesis studies*

As such, a distinctive contribution of this thesis lies not only in the decision to use a mixed-methods framework but also in the integration of quantitative and qualitative data sources. This decision was intentionally taken from the outset of the project rather than being reactionary or supplemental (Bryman, 2006a). Figure 1.4 illustrates the structure of this design, which incorporated both sequential and simultaneous data collection and analysis. For example, whilst the studies were conducted sequentially, studies 2 and 3 incorporated simultaneous features that highlight the originality of the methodological approach. For instance, the dataset underpinning study 3 (Chapter 5) was initially generated and subjected to high-level analysis prior to study 2 (Chapter 3). These analyses were subsequently embedded into the design of study 2, where they were used as stimuli material within focus groups (Chapter 4). This purpose was novel in two respects: first, it ensured that quantitative insights directly informed qualitative inquiry by provoking critical discussion among academy stakeholders. Second, it enabled reflection on how different forms of evidence resonated within practice, thereby illuminating how contextual resources (local schools and talent pool) were perceived to influence developmental processes.

Taken together, this carefully staged and adaptive integration of large-scale longitudinal datasets with qualitative insights from stakeholders across the talent system is an important methodological contribution of this thesis. This integration contextualised the quantitative results and allowed for a deeper examination of the talent system. In essence, this approach allowed for greater exploration of what data trends might exist and why those trends may have emerged, generating richer and more actionable findings than a purely quantitative perspective would have offered (Gillespie et al., 2024). Moreover, the iterative exchange between data analysis and stakeholder engagement not only added originality of the methodological design but, guided by a pragmatic philosophy, generated richer and more contextually relevant understanding than a single method approach. It also ensured that the research was positioned to offer practical insights of direct value to PRL and the wider rugby talent system.

#### *1.2.5.3 Multi-level insights*

The format of the data provided by PRL, combined with the qualitative insights generated through the academy focus groups, allowed for a consideration of the macro, meso, and micro levels of the talent system. This multi-layered design enabled the generation of a rich and multidimensional understanding of the system. Specifically, I analysed the data to examine how meso-level organisations collectively contribute to the broader talent system, thereby identifying macro-level trends. At the same time, I was able to compare individual academies to uncover deeper insights into their unique characteristics and how they diverge or align with these broader patterns. Limited research has had opportunity to generate such insights into talent systems, thus, the capacity to capture interactions across levels of analysis represents a novel and distinctive contribution of this thesis, extending the scope of existing scholarship on talent systems.

A methodological challenge concerned the presence of missing data across several of the datasets provided by PRL. Specific decisions and limitations regarding this missing data is highlighted in detail in each quantitative chapter. Importantly, this necessitated careful consideration in the design and interpretation of the quantitative analyses, but, I believe, did not fundamentally compromise the validity of the findings. For example, despite the absence of 61 academy PDG registration lists (Table 1.2), the dataset nevertheless comprised records for over 6,000 unique players (Table 1.1), offering an unprecedented basis for large-scale analysis of player development pathways in rugby union. Importantly, by engaging critically and collaboratively with the variability and incompleteness of the data additional insights of practical relevance were offered. For example, the inconsistencies of data collection in the academies highlighted systemic issues in data recording and management that, in themselves, provide actionable feedback for PRL and the RFU. In this respect, the thesis contributes not only to advancing academic knowledge but also to improving the infrastructure underpinning talent development in professional rugby union.

### **1.3 Aims and objectives of thesis**

Given the limitations of the current body of literature underpinning English rugby union talent development (see Chapter 1, section 1.1.3), this thesis aimed to generate practically useful information to inform policymakers. Specifically, the overarching aim of this thesis was to consider factors influencing the efficiency and effectiveness of the English rugby union talent system and the development of Premiership rugby players. The purpose being to inform strategic decision making and resource allocation. The aims and objectives of each chapter are summarised below.

#### ***1.3.1 Chapter 3: Study 1***

##### *1.3.1.1 Research aim*

To investigate the historic efficiency and effectiveness of the talent system and consider the influence of England Academy Player policy.

##### *1.3.1.2 Objectives*

- a) Calculate and compare the conversion of players into the Premiership (as marked by their debut appearance) between EAP status subtypes
- b) Calculate and compare the conversion of EAPs to the Premiership (as marked by debut appearance) between the 14 regional academies, considering each academy's contribution to net development
- c) Compare the likelihood of EAP and Non-EAP academy players making a Premiership debut via inferential statistics
- d) Investigate the influence of timing of status acquisition on the likelihood of achieving a Premiership debut appearance

### **1.3.2 Chapter 4: Study 2**

#### *1.3.2.1 Research aim:*

To qualitatively investigate the influence of contextual factors on academy efficiency and effectiveness

#### *1.3.2.2 Objectives:*

- a) To explore how contextual factors impact the efficiency and effectiveness of male academy talent development environments in English RU

### **1.3.3 Chapter 5: Study 3**

#### *1.3.3.1 Research aim:*

To quantitatively investigate how resources internal and external to each regional academy influence the quantity and quality of Premiership players developed.

#### *1.3.3.2 Objectives*

- a) Calculate the cost to develop a male Premiership player, considering differences between academy TDEs
- b) Investigate if there is a relationship between resources and the total number of players developed
- c) Explore the relationship between resources and the overall quality of players developed

### **1.3.4 Chapter 6: Study 4**

#### *1.3.4.1 Research aim:*

To implement machine learning to identify different pathways through the academy system to the English Premiership and consider how influencing factors may shape player progression.

Objectives

- a) Explore variations in player journeys from the academies to the Premiership
- b) Consider how relative age, playing position, and club may impact journey type

### **1.4 Programme of work**

Chapter 2 critically reviews the literature conceptualising talent, its identification and development, and how systems and organisations shape TD processes. This chapter also identifies some of the challenges of evaluating the efficiency and effectiveness of complex organisation systems and how this may apply to TD contexts. This literature review also critically reviews the current body of literature informing rugby union TD.

The first study, presented in Chapter 3, aimed to provide an overview of the talent system. Using data collected over a ten-year period, this study aimed to assess the proportion of players enrolled into English rugby union academies to progress to the Premiership league, the domestic elite rugby union competition. This study also sought to understand the impact of a policy first implemented in the 2010/11 season, which directed greater resource expenditure to a small select group of players identified to have the greatest potential to later become a senior elite player. Results of this study highlighted overall 11.7% of academy players progressed to the Premiership. Players identified to be high-potential were significantly more likely to become a Premiership player, with their odds increasing for every year younger they were initially conferred. However, the conversion

rate of these high-potential players substantially varied between the academies, suggesting potential differences in how players are identified and supported, and what opportunities are afforded to progress to the Premiership. Exploring these academy differences provided the basis for the studies reported in chapters 4 and 5.

Given the findings of Chapter 3, Chapter 4 aimed to qualitatively investigate contextual factors constraining TD. Focus groups were conducted with all fourteen regional academies, aiming to discuss factors influencing academy efficiency and effectiveness. Focus groups were transcribed verbatim and subsequently analysed using reflexive thematic analysis. Analysis led to the generation of four themes to explain the influence of contextual factors on academy efficiency and effectiveness: ‘multiple loosely connected concurrent environments’, ‘system rules and regulations drive practice’, ‘organisational influences’, and ‘searching for bang for buck’. Overall, this study demonstrates that the TD environments, organisational structures, resource availability, and other players influence an individual’s development and progression, not just coaching or performance alone. Academy resources, talent pool, and local schools were perceived to be critical factors impacting academy efficiency and effectiveness. This informed the study reported in Chapter 5.

The study reported in Chapter 5 quantitatively investigates the relationship between academy resource availability, academy cost efficiency, and effectiveness. Considering retrospective data collected over an eight-year period, analysis compared each academy’s resource availability (financial capital, human resources, schools, talent pool, boundary population) between 2016/17-2019/20 seasons to the number of Premiership players developed, and the number of Premiership appearances subsequently achieved, between 2020/21-2023/24 seasons. Regression analysis indicated that the number of Premiership players developed by academies was not influenced by their overall resourcing. However, there was a negative association between ‘staff count’ and the

number of Premiership appearances achieved. Cost efficiency was calculated by dividing the total financial spend of the academies by the number of Premiership players developed; there were no significant differences between academies. Overall, results of this study indicate that academies are not inherently advantaged by having access to greater financial or human resources, or who have greater population, talent pool, or more high-performing rugby schools in their boundary. Instead, I suggest that how resources are used may be more important to TD.

Chapter 6 presents a study utilising machine learning techniques to explore different pathways from the academies to the Premiership. Whilst Chapter 3 utilised conversion rates to consider the ultimate progression of players to the Premiership, conversion rates in their simplicity do not necessarily capture the complexity and non-linearity of TD. In this study, unsupervised clustering analysis was utilised to explore player journeys through the talent system and the various routes a player may take to reach the Premiership. Plotting progression through the talent system, stages included nomination as an England Academy Player, lower league match appearances in RFU Championship, National League 1 and 2, and Premiership league appearances. Considering a sample of 407 players, journeys were plotted and grouped by cluster analysis, yielding four journey archetypes of player progression. The study considered how relative age, playing position, club may impact the type of journey a player takes.

Finally, Chapter 7 summaries the findings of the thesis, discusses the contributions of the thesis to the literature, and the practical recommendations for Premiership Rugby resulting from the presented studies. This chapter also outlines areas for future research within this domain and highlights the strengths and limitations of this thesis.

## **1.5 Delimitations**

The aims of this thesis were to produce practically meaningful information to support policy and resource decision making in English rugby union. All studies presented in this thesis utilised data specific to the English rugby union context. This alongside the pragmatic positioning influencing the design of the research presented, the work presented in this thesis may not be directly transferrable to other contexts (Gavin et al., 2024). Specifically, the research presented in this thesis utilised data and practitioner experiences of the male talent system. As such, whilst operating in the same national context, there may be limited transferability between the English male and female talent systems.

As previously highlighted, there were several limitations to the data available to the project. Incomplete and missing data shaped the methodological decisions taken in Chapters 3, 4 and 6. In each chapter specific decisions and limitations of the analyses due to missing data are discussed. Otherwise, certain data (such as age grade and international match data) was not made available to the project, limiting analysis to the English domestic competitions.

## **Chapter 2: Literature Review**

### **2.1 Understanding terminology**

‘Talent’ and ‘elite’ are particularly common terms used in sport performance domains. However, as with other terminology, the lack of terminological clarity of ‘talent’ and ‘elite’ means that within research and practice how these terms are conceptualised lacks consistency (Grainger et al., 2024; Johnston et al., 2023; McAuley et al., 2022). Reflecting on the importance of terminological clarity, it is important to discuss how such terms are conceptualised and their meaning to this thesis.

#### **2.1.1 Talent**

‘Talent’ is often used in conjunction with terms such as ‘development’, ‘identification’, and ‘selection’ to describe processes that support the progression of junior athletes into senior high-performance sport. The term is also applied to individuals (e.g., ‘talented’) or to describe attributes they possess (e.g., ‘they have talent’). However, there is variation in how the term ‘talent’ is applied. As examples, in practice, even within the same contexts, talent is often used to describe both senior elite performers and young athletes with high potential, as well as being used to describe individuals with greater than average abilities (Johnston & Baker, 2022). In research, Copley et al., (2012) suggested that “talent refers to the quality (or qualities) identified at an earlier time that promotes (or predicts) exceptionality at a future time” (p. 3). Whereas Issurin (2017) defined talent as “a special ability that allows someone to reach excellence in some activity in a given domain” (p. 1994). In contrast to conceptions of talent as dynamic and developmental (Gagné, 1985, 2005), these definitions have little consideration for differences between current performance and potential future performance, and are unclear whether talent is a fixed capacity or whether it is developable. As an implication, the lack of clarity surrounding ‘talent’ (Johnston et al., 2023) may shape research designs or practical decisions within TD and sport systems. Take for example ‘talent identification’ and the potential implications of a lack of clarity between practitioners in an applied

setting - are they identifying athletes who currently possess a superior performance level, or athletes with the potential to develop into the future? Given the conceptual uncertainty surrounding the term talent and the potential implications for applied practice, it is essential to critically examine and consider its theoretical underpinnings.

In both the academic and popular discourse, 'talent' has typically been framed on a nature-nurture dichotomy, a framing that tends to polarise attributing superior performance to either innate, genetically determined traits (the nature perspective; Howe et al., 1998), or to environmental influences and developmental experiences (the nurture standpoint; Gagné, 1985). A binary perspective oversimplifies the complex interplay of biological, psychological, social and systemic factors that contribute to the identification and development of talent (McGawley, 2024). However, despite calls to move away from dichotomous conceptualisations of talent (Baker & Wattie, 2018; Davids & Baker, 2007), nature-nurture perspectives continue to shape perceptions of talent and, in practice, decisions about the identification and development of high-potential young athletes. Whilst definitions may differ in the origins of 'talent', often it is agreed that talent requires development for an athlete's full potential to be achieved (Gagné, 2005; Howe et al., 1998).

As shown in Figure 2.1, the Differential Model for Giftedness and Talent (DMGT; Gagné, 2005, 2021) suggests that talent is developed from an individual's natural abilities and giftedness via developmental processes facilitated by environmental, intrapersonal catalysts, and the element of chance (e.g., a person's heredity and formative environment; Gagné, 2021). The role of developmental processes, and environmental and intrapersonal catalysts infer 'talent' may not be achieved if the individual is not exposed to the appropriate conditions. As such, fostering environments and designing processes which facilitate TD is an important consideration for talent systems. An alternate way of viewing the catalysts outlined by Gagné (2021) is as features that

allow athletes to cope and remain within talent systems to continue their development. As such, rather than just focusing on an individual’s innate abilities or talent, it is important to consider a range, and interaction, of factors that underpin an individual’s capacity for future senior elite performance.

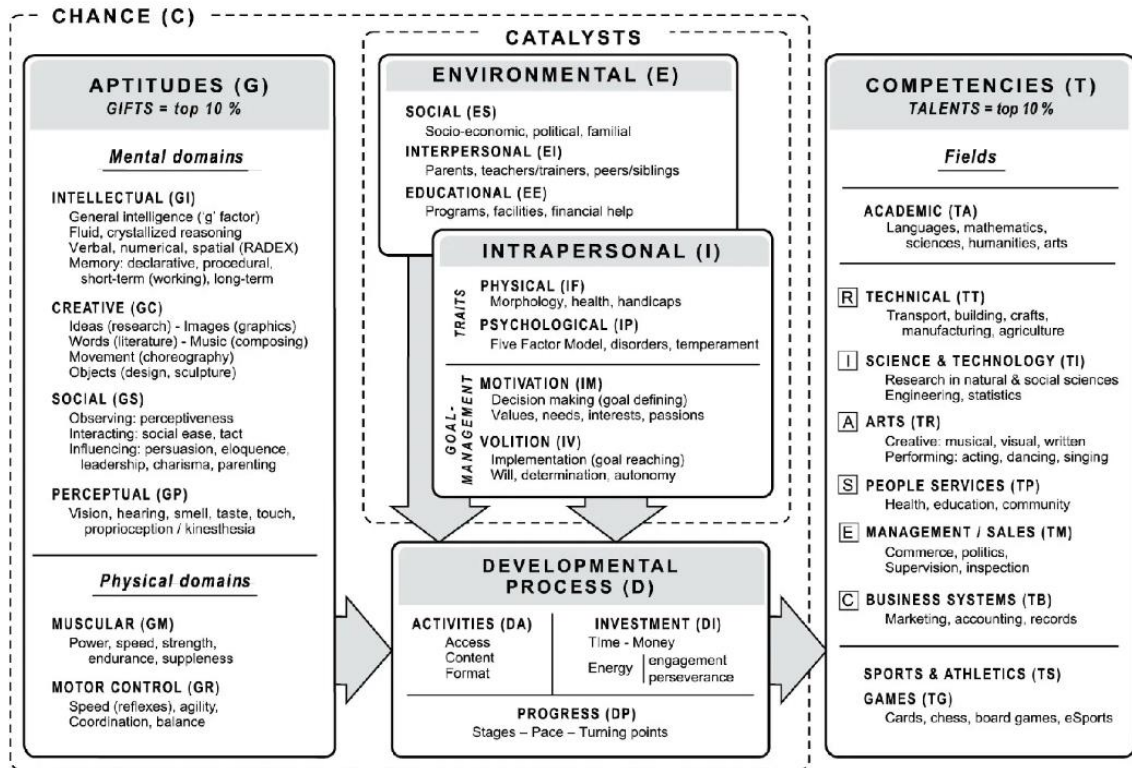


Figure 2.1 Differentiated Model of Giftedness and Talent (DGMT; Gagné, 2021)

It is widely acknowledged that developing talent is a non-linear process. This is reflected in the inevitable setbacks in an individual’s progression (Collins et al., 2016; Taylor & Collins, 2019), and in meta-analyses suggesting that the highest performing senior athletes were rarely the highest performing junior athletes (Barth et al., 2023; Güllich et al., 2023). As such, conceptualisations need to reflect that ‘talent’ is also dynamic. Baker et al., (2019) framed talent to be partially innate (originating in genetic components present at birth), multi-dimensional (i.e., cognitive, physical, psychological domains), emergenic (resulting from an interaction of factors), dynamic (evolves

over time with interaction), and symbiotic (its value is determined by social and cultural factors). As such, this framing of talent proposes that talent cannot be simply viewed on nature-nurture dichotomy, but rather is highly complex and contextually driven (Baker et al., 2019).

The symbiotic component of Baker and colleague's (2019) model of offers an interesting perspective as it suggests talent is not just contextually driven (Johnston & Baker, 2022) but also socially driven. In this sense, talent may be considered as a social construct (John & Thiel, 2022). John and Thiel (2022) suggest that 'talent' is influenced by a sport organisation's performance needs. For instance, a club's preferred playing style may determine which athlete attributes are valued during identification and development. In turn, these determinants of senior high-performance may implicitly serve as talent descriptors (John & Thiel, 2022) and contribute to the variability in defining talent across sporting contexts (Johnston & Baker, 2022). If talent is a social construct influenced by the preferences of influential performance staff (e.g., head coach), it is important to note that these preferences may also be subject to change with staff turnover, highlighting the contextual and subjective nature of talent.

Given the context of this thesis, I commonly use the term 'talent'. Reflecting the need for conceptual clarity, I use this term in reference to Gagne's DMGT model (Gagné, 2005): talent is an output of development. As such, talent identification refers to the identification of individuals with potential to be talented, and talent systems encapsulate the processes designed to develop talent.

### 2.1.2 *Elite*

The term ‘elite’ also suffers from terminological ambiguity, used to describe both youth athletes (cf. Kirkland & O’Sullivan, 2018) and senior international athletes (Johnston et al., 2018). A lack of conceptual clarity of what it means to be ‘elite’ may undermine efforts to understand elite performance, and in turn, how elite performers are developed. Also, it is important to consider ‘elite’ is also used to describe coaching standards (i.e., elite coach), albeit this has received less research attention compared to athletes. Whilst it has been suggested that terms such as ‘high-performance’ be used instead to avoid misinterpretations (Williams et al., 2017), the term ‘elite’ persists in sporting contexts and popular discourse. As such, it is important to consider what is meant by this term.

Highlighting the lack of consistency of the term ‘elite’, Swann et al. (2015) observed eight broad definitions of elite used in research. Athletes participating in international/national competitions, university competitions, and regional level competitions were all classified as ‘elite’ by various studies. Other definitions regarded an athlete’s sport specific experience (measured in years) to infer ‘eliteness’, as well as the level of professionalism of the sport, and sport specific measures (e.g., ‘black belt’).

It seems that context plays a crucial role in defining what constitutes being ‘elite’. In sports where outcomes are measured in centimetres, grams, or seconds, level of performance can be directly inferred and compared through objective performance measures, and as such may reflect ‘eliteness’. By contrast, in team sports where success is determined through more subjective scoring systems (e.g., tries and conversions in rugby union), assessments of ‘eliteness’ rely more heavily on comparisons between teams. In this sense, a team’s ‘eliteness’ may be inferred from the level of competition they participate in (e.g., Premier League), which may inform the ‘eliteness’ of

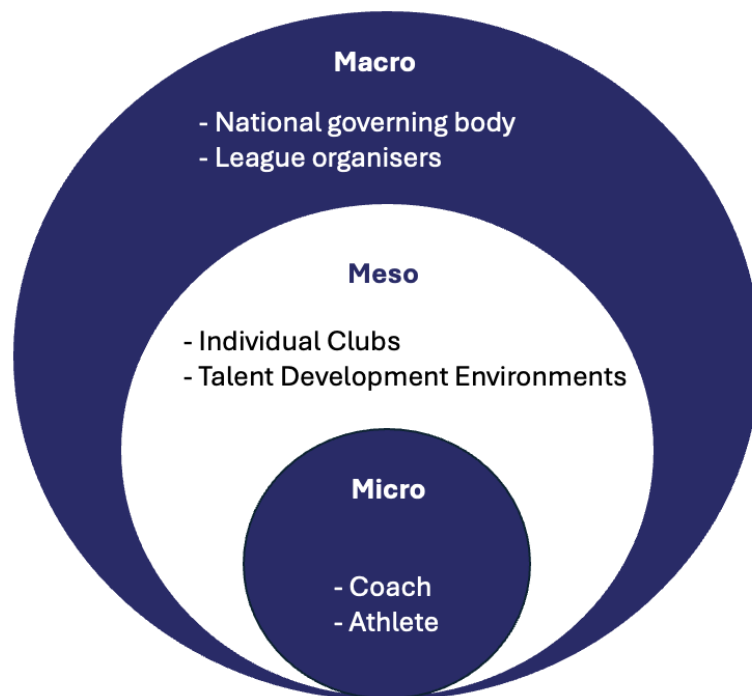
the individual team members. Otherwise, 'eliteness' may be implied by the exclusivity of the teams they are selected to represent (e.g., the British and Irish Lions in rugby union). However, reflective of the importance of comparison, Williams et al., (2017) noted that if using international participation as a marker of 'eliteness', it is important to evaluate the team in relation to the global stage. Although an international team may be considered elite within the context of its own nation's sporting population, it may still rank low worldwide and therefore be comparatively 'non-elite' when measured against other nations.

Taken together, the literature highlights that 'elite' is an inconsistent and context-dependent label, applied variously to athletes, coaches, competitions, and development pathways. Attempts to formalise the concept, such as Swann and colleagues (2015) criteria, offer some structure. However, key dimensions such as athlete age, or relative status within youth versus senior sport are overlooked. Indeed, using the term 'elite' to describe young developing athletes may be problematic given poor predictive accuracy of early talent models and the evolving nature of ability (McAuley et al., 2022).

Given this ambiguity, it is important for research to be explicit about what is meant by 'elite' (McAuley et al., 2022). In this thesis, the term is used sparingly and refers specifically to athletes competing in the English men's senior top-flight domestic competition (the Premiership), and those achieving senior international match appearances.

## 2.2 Talent system structure

As outlined in the previous section, talent is considered as emergent, developable, and dynamic (Baker et al., 2019). Reflecting this, talent systems provide structured frameworks designed to facilitate the progression of junior athletes towards senior performance and are comprised of a network of people, organisations and processes aligned with this goal. Talent systems may be considered as a system of multiple levels of interaction, with the organisations, people and processes comprising the talent system being divided into macro, meso, and micro levels (Taylor, MacNamara, et al., 2022; Figure 2.2). As such, it is important to recognise how each level of the talent system may influence the development of athletes both as a population and as individuals.



*Figure 2.2 Depiction of talent system as a nested structure comprised of macro, meso, and micro levels*

### **2.2.1 Macro-level**

The macro-level considers those responsible for the shaping of policy and management of a sport across a broad context, for example in a national context. Depending on the sport, these include NGBs, governing agencies (e.g., UK Sport), or commercial organisations such as league organisers (e.g., Premier League).

Macro organisations set the constraints of the talent system through policy implementation, aiming to promote features of effective TD, defined as the ‘production’ of elite athletes (Feddersen et al., 2021, p. 30) and holistic development (Hauser et al., 2022). Typically, macro-level organisations may collaborate to achieve mutually beneficial goals rather than operating in isolation. For example, in professional sports, competition organisers may aim to promote competitiveness between teams. One way to achieve this is by encouraging and supporting the NGB in its efforts to develop talent. Macro organisations can direct the age at which initial selection into the talent system takes place, influence the number of athletes involved in each stage of the system (e.g., through competition quotas), influence developmental curricula, set coaching standards (e.g., minimum qualifications), and provide competition structures (e.g. PRL U18 academy league). In essence, the role of the macro-level in a talent system is to influence the operations of sport organisations operating at the meso-level, to influence practice on the micro-level, and to promote features and practices which support athlete development.

Macro system policies are central to the structure and operations of the talent system. Notably, the Sport Policy factors Leading to International Sporting Success (SPLISS) model highlights the extent to which sport policies impact national sporting success, clustering the contributing factors between nine policy areas, and specifying 31 sub-dimensions and 126 critical success factors as key elements within the policy areas that are necessary in improving the elite sport success of a

nation (De Bosscher et al., 2008). Research has quantified these factors and dimensions, finding that nations winning more medals at the Olympics and at World Champions typically score higher in SPLISS, conveying the nation's sport system may be better developed (De Bosscher et al., 2009). Whilst the original research implementing SPLISS considered the aggregate of multiple NGBs within each nation, the specific policies and contexts of individual NGBs need to be considered (Cahill & MacNamara, 2023). As such, talent systems aiming to replicate the policies of others with historic success must consider the wider socio-cultural context (Ramos et al., 2023). Even within nations and single sports, a challenge of the macro system is the governance across multiple contexts. For example, on the macro-level UK Sport oversees numerous NGBs, and a single NGB may oversee numerous meso organisations and even numerous sport disciplines (e.g., UK Athletics). As such implementing sport policies which drive effective practice across broad contexts is a complex challenge.

Adding to the complexity of elite and professional sport is the roles of commercial (e.g., league organisers), non-profit (e.g., NGBs), and public (e.g., government funded institutes) macro-level organisations. There are suggestions that commercialisation is an important contextual factor shaping TD policies in sport (Houlihan, 2013). For example, many professional sport leagues have an interest in protecting and expanding the value of their product, which may be achieved by increasing the competitiveness of the league (Houlihan, 2013). This may have direct or indirect impact on athlete recruitment and TD, prompting regulations such as those incentivising developing homegrown players (Bullough & Jordan, 2017). In this sense, macro-level organisation agendas (e.g., league competitiveness) and policies (e.g., homegrown players) impact the practices of the meso-level (e.g., athlete recruitment and development considerations), and ultimately impact the micro-level (e.g., opportunities afforded to developing players).

### **2.2.2 Meso-level**

The meso-level of a talent system consists of individual clubs and talent development environments (TDEs) operating within the talent system under the governance of the macro-level organisations and work directly with athletes. As with considerations at the macro-level of differing contexts between NGBs, the potentially differing contexts of organisations operating on the meso level need to be considered. Often these organisations, such as TDEs in the organisational format of academies, are the mediator between macro sport policies and the individual athletes.

Perhaps unsurprisingly because of this interaction, much of the research into TD has focused on the influence of meso level organisations, specifically the role of the TDE (Haukli et al., 2021; Larsen et al., 2013, 2020; Mills et al., 2014). TDEs are defined as ‘all aspects of the coaching situation’ influencing athlete development (Martindale et al., 2005; p. 354), and are considered to be the most immediately controllable aspect of athletic development (Martindale et al., 2007). As such, there is great research and practical interest in understanding how effective TDEs may be curated (e.g., Gledhill et al., 2025). In an early study, Martindale et al., (2005) proposed five key features of TDEs facilitating athlete performance development, including:

- long-term aims and methods that are systematically planned and implemented
- coherent support networks and messages
- emphasis on appropriate development over early success
- individualised and on-going development
- an integrated, holistic and systematic overall approach (that covers the previous four factors)

These features have subsequently been examined across a range of sports and contexts (Gangsø et al., 2021; Larsen et al., 2013, 2020; Mills et al., 2014). Whilst Martindale focused on the TDE as a

sport domain and the immediate sport training environment, Henriksen et al., (2010a) built on this work by proposing a holistic ecological approach, suggesting that TD is greatly influenced by numerous factors occurring in an athlete's immediate and wider environment, in both sport and non-sport domains. In this sense, the Athletic Talent Development Environment (ATDE) considers the whole context of an individual athlete, with the interconnectedness of multiple factors and domains which cannot necessarily be considered in isolation. Henriksen (2010) described the ATDE as:

A dynamic system comprising (a) an athlete's immediate surroundings at the micro level where athletic and personal development take place, (b) the interrelations between these surroundings, (c) at the macro level, the larger context in which these surroundings are embedded, and (d) the organizational culture of the sports club or team, which is an integrative factor of the athletic talent development environment's effectiveness in helping young talented athletes to develop into senior elite athletes (p.161).

Henriksen et al., (2010a) proposed two models for considering the structural and procedural elements of an TDE. The first model, the ATDE, considers a TDE as “a system of an athlete's interactions inside and outside sport on the micro-level and how these interactions are influenced by the macro-level” (Henriksen, 2010, p.29). The model considers athlete development on different levels, and between athletic and non-athletic domains (Figure 2.3). Interestingly, this model proposes that all aspects of the athlete's context to be a single environment; for instance, an athlete's local club and school are an extension of the same environment. As the model was developed in Scandinavian sport, this likely reflects the TD approaches of that context. As such, whilst encouraging consideration of the influence of many stakeholders in an athlete's development, the ATDE may not be directly transferable to other contexts. For instance, as

discussed in Chapter 1, in the English rugby union context, an athlete's academy TDE and school operate as independent entities and would be classified as different environments.

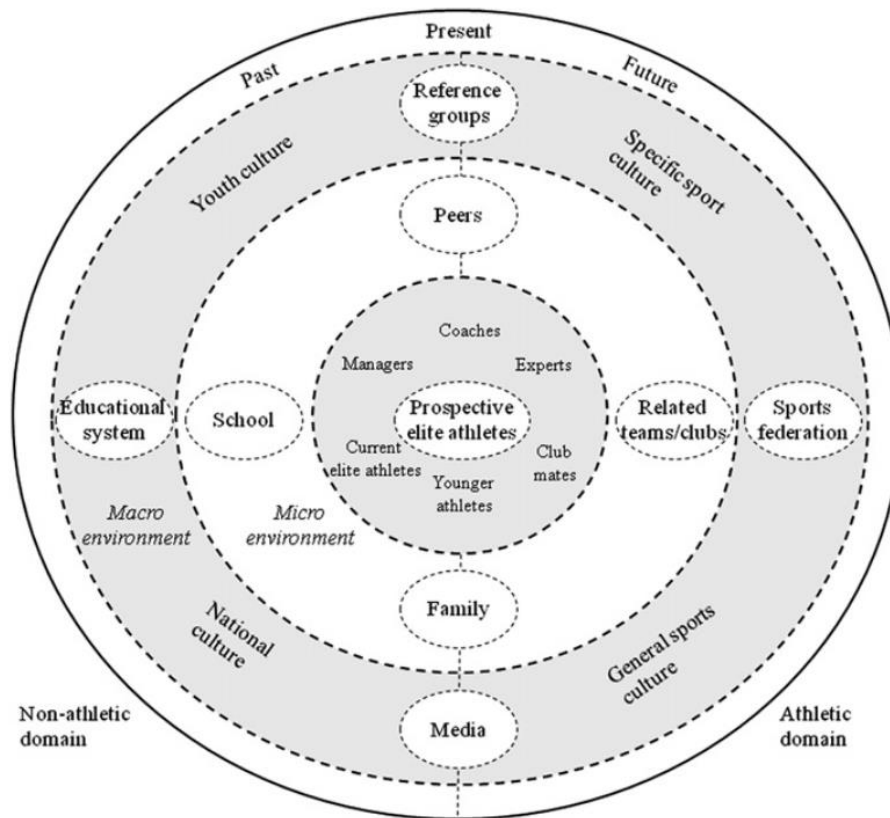


Figure 2.3 Athletic talent development environment working model (Henriksen et al., 2010a)

Whilst the ATDE model provides a description of the environment, it does not explain why an environment is effective. To this end, the Environment Success Factors (ESF) model provides a framework to consider factors contributing to an environments effectiveness (Figure 2.4; Henriksen et al., 2010). With organisational culture positioned at the core, the ESF model describes how the outcomes of the environment (individual and team achievements, and individual development) result from the interaction of the environment's preconditions and processes.

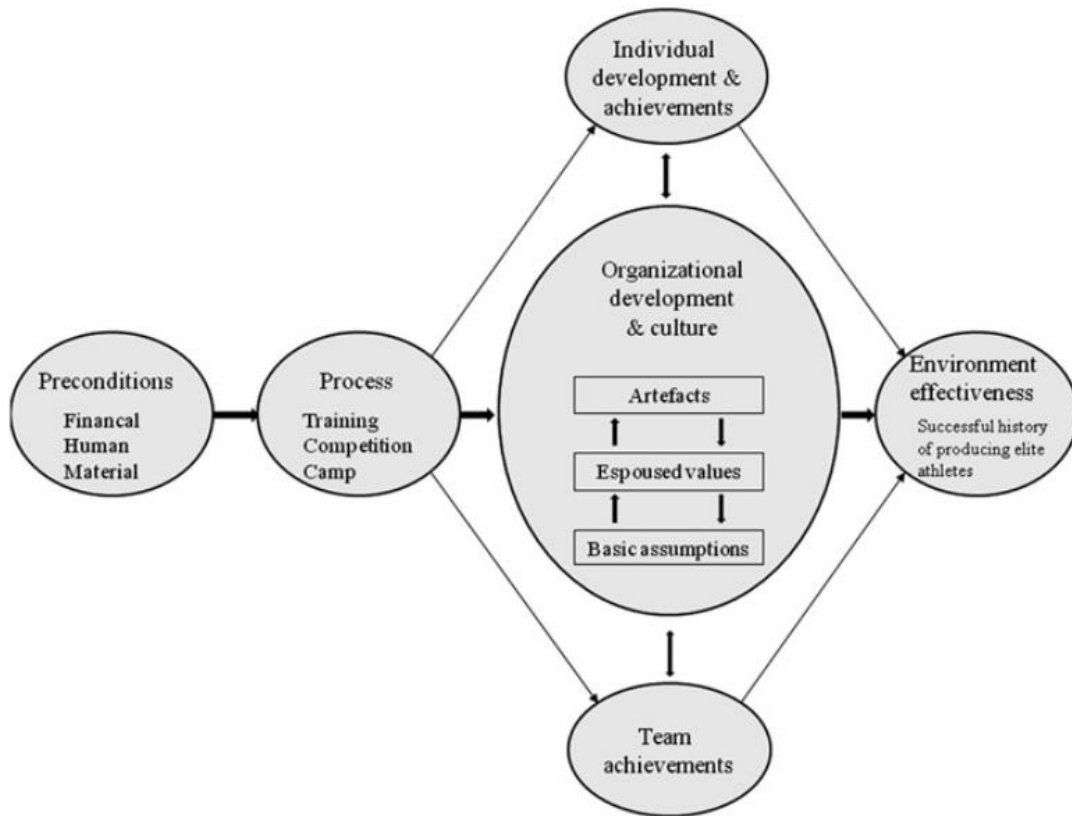


Figure 2.4 Environment Success Factors model (Henriksen et al., 2010a)

Henriksen et al., (2010a, 2010b, 2011) considered the effectiveness of the ATDE based upon the environment’s ability to continually develop elite athletes, and considered an ineffective ATDE to be one which aims to develop athletes but lacks success in this goal (Henriksen et al., 2014). To identify the features of effective and less effective ATDEs, Henriksen (2010) observed ATDEs which had success or limited success of producing elite athletes. As Feddersen et al. (2021) highlighted in their review, this has led to conclusions that environments are successful because of features generally viewed as positive or desirable (e.g., supportive relationships), with the potential adaptive contributions of features typically viewed as negative or undesirable being marginalised. This reinforces the need for nuance in evaluating environmental features, and acknowledgement that some ‘effective’ environmental features may not be transferrable. For example, between

observing a successful (Henriksen et al., 2010a) and a less successful (Henriksen et al., 2014) ATDE, there were contradictory conclusions of the (in)effectiveness of training groups encompassing different skill levels. As such, some effective features of TDEs may be contextually specific.

Despite the theoretical and practical differences between Martindale et al. (2005; 2007) and Henriksen et al. (2010a, 2010b) conceptualisations of the TDE, both highlight the importance of ‘coherence’. Coherence is the extent to which elements of an athlete’s experience are mutually reinforcing (Taylor & Collins, 2022), and can be considered vertically (between levels of performance), or horizontally (across levels of performance). Whilst research has observed the high volume of stakeholders involved in an athlete’s development may challenge achieving and maintaining coherent practice (Bjørndal & Ronglan, 2018; Taylor, Collins, et al., 2022), the impact of multiple environments has received little consideration. In contexts where there are potentially multiple concurrent environments impacting an athlete’s development (e.g. school, club, academy, age-grade international squads), coherence is a key consideration.

Whilst multiple concurrent development environments have not been considered, research has considered the role of interorganisational relationships in promoting athlete development, highlighting the necessity of common goals and collaborative decision making and actions (Babiak et al., 2018; Mathorne et al., 2021; Mathorne et al., 2020; Sotiriadou et al., 2017). However, a limitation of this body of research is that it has mainly focused on collaboration between a limited number of organisations, each with complimentary agendas, with athletes only directly interacting with one organisation. As such whilst we may be able to apply some of the findings considering interorganisational relationships in pursuit of coherence, some recommended features may be difficult to implement and be practically unfeasible when considering athletes in concurrent

environments. For example, within one junior sport TDE, athlete cohorts may attend multiple different schools making it challenging to negotiate formal mutually agreed upon operational agreements with each. As such, achieving coherence between multiple TDEs is a challenging and complex task.

However, there is also a need to achieve coherence within an organisation, as such, it is also important to consider integration. Integration refers to the extent the various inputs into the athlete are systematically combined (Taylor & Collins, 2022). Like coherence integration can be considered vertically and horizontally. Vertical integration considers the extent to which working practices are connected through a sporting organisation (e.g., a professional club and their linked academy). Whereas horizontal integration considers the extent to which multiple stakeholders working together with, and actively engaging, the athlete across a level of performance.

### ***2.2.3 Micro-level***

The micro-level of the talent system consists of the interactions between individual athletes, coaches, and sport science support staff, shaping the development experience of young athletes. Micro-level factors include those which enable or constrain athlete engagement with talent systems, and those which influence how coaches and practitioners allocate resources (Taylor, MacNamara, et al., 2022). As the micro-level considers the interaction between athletes and practitioners, it is important to consider factors which influence these interactions.

Coaches play an integral and explicit role in an athlete's development (Côté et al., 2010), however, it is also important to consider their implicit impact on development. Several expectancy effects, whereby expectations of an athlete result in differential treatment, have been considered to influence athlete development. Expectancy theory suggests a person's expectations of another are

conveyed in their expressed behaviours towards them (Rosenthal & Jacobson, 1968). A four-step cycle has been proposed to demonstrate how expectancy effects are evoked (Solomon, 2008). In the first, a coach forms an expectation of an athlete based upon performance, personal, and psychological cues. In step two, this expectation alters the coach's subsequent treatment of the athlete. In turn, the athlete alters their behaviour in reflection of the coach's behaviour as step three. This then results in step four, whereby the performance of the athlete meets the expectation of the coach, reinforcing the initial expectation. As such, expectancy effects raise questions for talent identification and development including what information coaches use to form initial expectations, how feedback processes shift based on expectations, how consistent the formed expectations are, how athletes make meaning from feedback, and the permanence of the athlete's altered behaviour. From a resource perspective, relative expectation of athletes may influence the relative resources offered to aid individual development. Expectancy effects support the proposition that beliefs about talent matter and are consequential for development (Baker et al., 2018).

Alongside expectancy theory, it is also important to consider labelling theory. Whilst it was originally proposed to explain deviant social behaviours (Becker, 1963), labelling theory considers how social labels may contribute to the development of behaviour and self-identity (Bernburg, 2009) and is of interest in education settings (Klimecká, 2023, 2024). In essence, the theory assumes that the behaviour of an individual may stem from various causes or conditions, but once socially recognised and a label is assigned, the individual is subjected to social expectations associated with the label (Bernburg, 2009). As such, the individual may internalise the label and further engage in said behaviour, reinforcing the label (Lemert, 1972), or may resist the label and alter their behaviour. Like with expectancy theory, the interactions between a coach and an athlete may differ based upon the coaches' expectations, however, labelling theory would consider the

wider social consequences of the label. For example, the label may alter the perceptions of other coaches, development stakeholders, and athletes, thus influencing the network of social interactions surrounding the labelled athlete. Otherwise, it is also interesting to consider the impact of not labelling an individual. Not labelling an athlete as ‘talented’ may implicitly imply they are not talented compared to a labelled peer, which may influence their motivations and actions. As such, whilst currently not considered in sport TD contexts (Baker, 2022), it is interesting to consider how labelling theory may apply to sport and how labels may influence an individual athlete’s developmental experience.

Also having the potential to impact resource distribution and accumulation of resources between athletes are Matthew effects (Morgan et al., 2008). Matthew effects postulate that initial advantages may accumulate additional advantages (“the rich get richer”), and have been observed in educational domains (Cain & Oakhill, 2011; Duff et al., 2015; Herrmann et al., 2022). In sport contexts, Matthew effects have been observed in senior athlete cohorts (Barth, Michael et al., 2018), and have been proposed to influence athlete development (Baker, 2022). For example, athletes who are perceived to have greater potential may receive investment, in turn leading to greater performance, thus receive more investment. Matthew effects have been proposed to be absolute or relative. Where resources are a fixed quantity, advantaged athletes will get ‘richer’ whilst disadvantaged athletes get ‘poorer’. For example, selection to a match day squad enables a player to accrue game time, but selection spots are limited. A player selected to the squad gets ‘richer’ compared to their non-selected peers. On the other hand, relative Matthew effects occur when all athletes gain but to different extents (Baker, 2022). For example, amongst a cohort of athletes in an academy being developed towards senior elite performance, some may have access to high-quality coaching external to the academy in concurrent environments (e.g., international squads). Whilst all receive input into their development from the academy, some players may

overall receive more and may be comparatively 'richer'. In this sense, players able to obtain more experience early may have advantages as they progress through the talent system. As such, Matthew effects are an important consideration for developing talent, especially when considered alongside 'push and pull' factors or expectancy effects.

The early features of an individual athlete's experience that present either relative advantage or disadvantage have been termed 'push' and 'pull' factors respectively (McCarthy et al., 2022; Sweeney, Taylor, et al., 2023). The balance between 'push' and 'pull' factors may influence an athlete's development progression and performance. Whilst a degree of 'push' factors may, at least at that stage of the pathway, provide players with greater access to TD opportunities, an overabundance of 'push' factors *may* hinder progression later. In contrast, a large volume of 'pull' factors may provide an unmanageable volume of challenge and constrain development. At the same time, a degree of 'pull' factors experienced early also may facilitate development and progression (Collins & MacNamara, 2012).

In this manner, push and pull factors interact with and modulate challenge dynamics (Sweeney, Taylor, et al., 2023), with the role of challenge having received considerable research attention. There is increasing support that experiencing and overcoming a range of challenges, whether planned or unplanned, or common or uncommon (Papastaikoudis et al., 2024), are critical in the facilitation of an athlete's development (Collins & MacNamara, 2012). At the micro-level, coaches' appreciation and consideration for push and pull factors may help to appropriately manage an individual's degree of challenge. How individuals interpret and experience challenge is highly idiosyncratic (Williams & MacNamara, 2022), as such requires the coach to have granular understanding of the athlete and their circumstances (Sweeney, Taylor, et al., 2023). In this sense, a challenge of TD is the balance of coaches catering for individual needs whilst working within a

standardised framework set by the macro-system. As such, consideration needs to be given to how the macro-level of the talent system may influence the actions of coaches and their ability to support developing players.

Sweeney et al. (2023) considered relative age effects (RAEs) to be consequence of push and pull factor influencing athlete development, observable at the population level. RAE refers to a side effect of chronological age groupings, whereby in an annual grouping there may be a 12-month chronological age difference between the eldest and youngest athletes within the cohort. Athletes born close after age-grade cut-off dates are relatively older compared to those born close before the cut-off date and are disproportionately represented in junior sport cohorts compared to relatively younger athletes. Whilst RAE studies are largely focused on population trends, considering large cohorts of athletes and ultimate progression through the talent system (Brustio, Cardinale, et al., 2022; Brustio, Modena, et al., 2023; Kelly et al., 2020), these trends indicate that initial access to talent systems may be unequal. There are arguments that RAEs demonstrate an inefficiency in talent identification and development (Craig et al., 2025), framing RAE as a problem which needs to be solved.

There have been several interventions proposed to address RAE, such as manipulating initial selection practices to attempt to grant equal access to the talent system (Bennett et al., 2019; Helsen et al., 1998; Mann & Van Ginneken, 2017). However, such an approach ignores compounding factors; relatively older players are not universally advantaged compared to relatively younger players (Sweeney et al., 2024). Also, such selection practices still require the exclusion of certain players from the talent system who may otherwise have been selected - there is always going to be an inherent risk 'wrongful' selection decisions (Johnston & Baker, 2020). Beyond initial selection into the talent system, there is indication that access to opportunities may still be influenced by the

player's relative age (Kelly, Jackson, et al., 2021; Lewis et al., 2015). Combined with the overrepresentation of relatively younger players dropping out of sport (Delorme et al., 2011), it would seem attention needs to be paid relative (dis)advantages relative age may pose and represent.

This is especially pertinent given the increasing evidence of RAE advantage reversal; whilst relatively older players may be more likely to be initially selected, relatively younger players may be more likely to progress from junior into senior cohorts (Brustio, Stival, et al., 2023; Kelly et al., 2020; McCarthy et al., 2016; McCarthy & Collins, 2014). Sweeney et al. (2023) postulate that relatively older players may experience greater early push factors whilst relatively younger players greater early pull factors. By having to cope with and overcome the degree of increased challenge posed by being relatively younger, challenge dynamics may contribute to the RAE advantage reversal observed at the junior-senior transition (Brustio, Stival, et al., 2023; Kelly et al., 2020; McCarthy et al., 2022). In this sense, there is a need to understand how RAEs may impact processes of development and not just the input and output of talent systems.

It has been suggested there is a need to look beyond the role of identification and selection in RAEs, and consider the role of organisational and cultural factors of the talent system (Sweeney et al., 2024). For example, Bennett et al., (2023) reported an interaction of RAEs with TDE selection boundaries - relatively older athletes' probability of being selected into a regional talent pathway increased in regions with a larger talent pool. In this sense, RAEs are a pertinent example of the interactions between the various levels of the talent system. Ultimately, policy decisions regarding selection dates and managing talent pools impact on how individual athletes interact with the talent system.

Overall, a key consideration for TD is the management of the talent system, and how the macro, meso, and micro levels interact to promote effective practices, and ensure athletes are given adequate opportunities to develop and progress. However, much of the research into TD has considered each of these levels in isolation, with little consideration of how the different levels influence each other. Further, this body of work has tended to investigate how each level impacts the outcomes of TD rather than the process of TD. As such, there is a need to consider the interaction between macro, meso, and micro levels of the talent system and how they together influence the process of TD.

## **2.3 Talent system considerations and evaluation**

### ***2.3.1 Resource considerations***

Resources have been identified as a key factor in explaining the success of talent systems, with links between resources and sporting outcomes robustly established at the macro-level (De Bosscher et al., 2009). Resources may be considered as tangible (e.g., finances), intangible (e.g., time, culture), or human (e.g., attention) assets which can be utilised to achieve organisational objectives and leverage competitive advantage (Grant, 1999). Research has demonstrated that NGBs are reliant on adequate resources to enable an effective talent system (Robinson & Minikin, 2012). Otherwise, increased financial investment contributes to explain international sporting success (De Bosscher et al., 2009), and the strategic investment of resources into national sport systems may influence relative competitive advantage (Truyens et al., 2016). Such research demonstrates that resources impact the implementation of effective policy and performance outcomes across talent systems.

In some contexts, financial resources are heavily invested into talent systems. For example, in 2022 UK Sport announced an initial £29 million investment across nine sports to support their ambitions of the 2026 Winter Olympic games (UK Sport, 2023). However, even the best funded organisations will have limited time and attention resources (Taylor, MacNamara, et al., 2022). Time may be considered as the number of years between initial identification and senior elite performance, but also the regular contact time between an athlete and a TDE. Early research into TD postulated that to reach domain expertise (to be within the top 10% of performers; Gagné, 2005) significant time must be invested into highly structured, domain specific activity with the specific goal of improving performance (e.g., deliberate practice; Ericsson et al., 1993). As such to maximise the time resource, talent systems have historically engaged in early talent identification and selection strategies, attempting to predict early in an individual's athletic career whether they have the potential to reach the highest levels of senior performance. This may be problematic given the limited efficacy of early talent identification (Abbott et al., 2005). In some sports, however, where peak performance can be achieved mid to late adolescence (e.g., gymnastics, diving), to facilitate the time needed to develop an athlete, relatively early identification strategies may be necessary (Baker et al., 2018).

Early talent identification may also be viewed as 'early elimination', whereby athletes deemed to have less potential are not given the same development opportunities and thus are not invested in by the talent system. This results in talent systems and TDEs prioritising limited resources in athletes perceived to have greater potential, which is an important consideration when reflecting back to Matthew effects. Eliminating athletes from inclusion in talent systems may be beneficial for managing limited human resources such as attention, which considers the coaches and practitioners operating in the TDEs. Individualised development has been suggested to be a feature of effective TD (Martindale et al., 2005), however, the degree of individualised support is reliant

on the attentional bandwidth of practitioners, influenced by the ratio of staff to athletes. However, given the resource implications of talent identification as ‘early elimination’, and the potential impact selection decisions (Johnston & Baker, 2020), it is important to consider the earlier discussion of what ‘talent’ is and differences in how practitioners perceive it.

An alternative approach to early identification has been suggested, aiming to develop “as many [athletes] as possible, for as long as possible” (Erikstad et al., 2021). This contrast to early identification is reflective of talent being emergent, development being a non-linear and dynamic process, with potential being realised over time under the right context and conditions (Baker et al., 2019; Gagné, 2005). Thus this approach encourages development over time rather than accuracy of identification (Abbott & Collins, 2004). However, what is ‘possible’ is likely to be inherently constrained by resources and contextual factors, thus driving systemic decision making. For example, the number of athletes which can be supported by a TDE is going to be constrained by the number of suitable staff available to facilitate development opportunities, which in turn is constrained by financial resources available to compensate staff. In this sense, resources availability may have significant implications, especially if it necessitates athletes to be excluded from talent systems.

Deselection, especially at early stages of the athlete pathway, has important repercussions. Once deselected from a talent system an athlete’s odds of reaching senior elite performance seem greatly reduced in some contexts (Huijgen et al., 2014). This may be because of the disparities in resources and opportunities between deselected and retained athletes making it difficult for initially deselected athletes to re-enter the talent system. Although it is inevitable that ‘wrongful’ selection decisions will be made, talent systems must be diligent to limit this number (i.e. deselecting an athlete who may have had great potential or selecting an athlete with limited potential; Johnston &

Baker, 2020). This is a difficult balance to achieve given the non-linearity of development and a limited ability to accurately predict which athletes will later be successful (Barth et al., 2023; Bezuglov et al., 2022; Güllich et al., 2023; Güllich & Barth, 2024). As such, resource availability is likely to shape the decisions made by practitioners on the micro-level. Given these resource considerations, talent systems must balance their overall aim of developing senior elite athletes with necessarily limited resources. Therefore, to an extent, talent system design is a resource challenge, with talent identification and selection as tools to manage resource distribution.

### 2.3.2 Talent system effectiveness and efficiency

Given the interaction between talent system design and resource allocation, it is important to evaluate the talent system against its intended purpose and ensure resources are being appropriately invested. Evaluating has been defined as “the process of assessing the degree to which the organization as a whole and various units and individuals have accomplished what they set out to do” (Chelladurai, 2014, para. 1). Bayle and Madella (2002) suggested that sport organisational performance may be considered through both effectiveness and efficiency measures (Figure 2.5); effectiveness being the capacity to achieve organisational goals, efficiency being the balance between system inputs and system outputs (Madella et al., 2005).

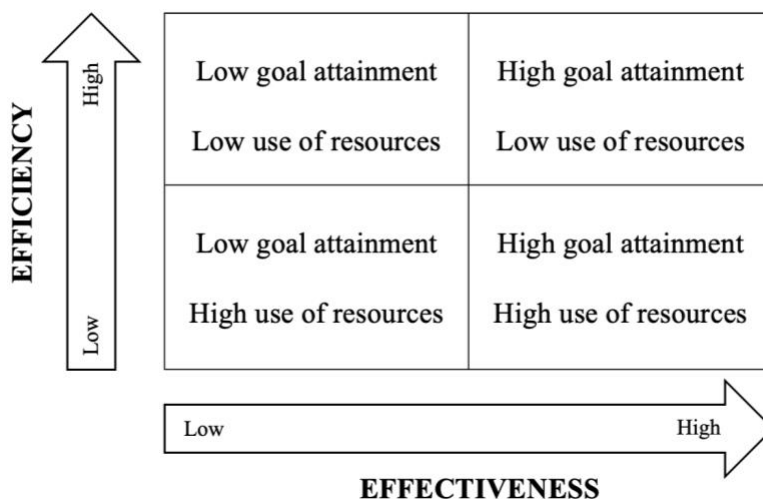


Figure 2.5 Effectiveness and efficiency in organisations (Chelladurai, 2014)

### 2.3.2.1 *Effectiveness*

Despite its importance, effectiveness is difficult to measure. Several models have been devised to explain organisational effectiveness. The 'Goals Model' simply defines effectiveness as the degree to which an organisation has achieved its goals (Strasser et al., 1981). This makes the assumption that because an organisation exists to achieve a goal its effectiveness is a function of achieving that purpose. The Goals Model stipulates that the goals of the organisation must be identifiable and clearly measurable. In this sense, the talent system effectiveness may be quantified in competitive results, rankings, or the number of athletes qualifying for elite competition (e.g., De Bosscher et al., 2009).

Yet, this approach is inadequate if the organisation has multiple goals (Strasser et al., 1981). For example, an NGB may have goals to increase national grassroots participation and for its elite team to improve their world ranking - if only one of these goals is achieved, is the organisation effective? This may be further complicated if the multiple goals are conflicting; for example if one goal of the organisation required significant funding to be achieved, but a second goal was to reduce programme costs. Otherwise, the Goal Model is limited if the goal of the organisation is not easily quantifiable, for example if a goal was to achieve 'holistic development'. As such, the simplistic approach proposed by the Goals Model may be inadequate in determining the overall effectiveness of complex organisational structures (Connolly et al., 1980), such as a talent system

In another approach, the Systems Resource Model of organisational effectiveness focuses on the inputs of the organisation, defining effectiveness as "the ability of the organisation, in either absolute or relative terms, to exploit its environment in the acquisition of scarce and valued resources" (Yuchtman & Seashore, 1967, p. 898). An example may be multiple clubs competing over a limited talent pool; from the perspective of System Resource Model, the most effective club

would be who could attract more high-potential athletes. Whereas the Goals Model is focused on outputs, the Systems Resource Model is focused on inputs. This model of effectiveness is suggested to be applicable to organisations where their outputs are not easily quantifiable, as such the quantity of inputs can be used to infer the acceptability of outputs (Yuchtman & Seashore, 1967). For example, if an NGB had a goal to improve the lives of community athletes engaged in the sport, they may reflect high-participation as a marker of effectiveness. However, in some instances, the inputs may be reliant on outputs, thus creating a feedback loop. For example, to attract more and better athletes, a club may need to achieve a certain level of output (e.g., finish the season with a high rank). In this sense, the outputs of the organisation improve their bargaining position to secure inputs (Yuchtman & Seashore, 1967).

Rather than focusing on inputs or outputs, the Process Model of Effectiveness suggests an organisation's effectiveness may be determined by the internal processes. Cameron (1980) summarised effective organisational processes as "those with an absence of internal strain, whose members are highly integrated into the system, whose internal functioning is smooth and typified by trust and benevolence toward individuals, where information flows smoothly both vertically and horizontally" (Cameron, 1980, p. 67). Furthermore, it has been suggested that effective processes should be adaptable to changes and flexible with workloads (Mott, 1972 cited in Chelladurai, 2014). In this model, effectiveness is based upon the evaluation of these internal processes against a predetermination of what effective processes should be, which may be a limitation. For example, an NGB may audit the TDEs on the meso-level against criteria deemed to reflect effective processes, with TDEs adapting their processes to fit the NGB's expectations despite these processes not being contextually effective. In this instance, TDE processes may be effective as deemed by the NGB, but ineffective in practice. An example of this may be TDEs required to engage and develop a prescribed number of athletes. However, this action may stretch resources and negatively

impact the quality of provision and developmental experience. Significant research has been conducted considering the effective processes and features of TDEs (Aalberg & Sæther, 2016; Gangsø et al., 2021; Larsen et al., 2013; Martindale et al., 2010; Mills et al., 2014). However, since processes are designed to achieve specific outcomes, their evaluation may still be influenced by whether those outcomes are achieved (cf. Henriksen et al., 2010a, 2014). In this sense, whilst the Process Model remains concerned with achieving outcomes, it places greater emphasis on *how* those outcomes are achieved compared to the Goals Model. As such, the effectiveness of a talent system may not just be measured by the development of elite athletes, but also by the quality and efficiency of the developmental processes it employs.

A limitation of these models of organisational effectiveness is that they are designed to consider singular, independent organisations. Talent systems often require the collaboration of networks of people, organisations and policies. Connolly et al., (1980) proposed organisational effectiveness could be considered through the Multiple-Constituency Approach, which considers the effectiveness of an organisation to be based upon the evaluation and agenda of the multiple individuals or groups (constituencies) directly or indirectly involved with the organisation. In this regard, the Multiple-Constituency Approach considers organisational effectiveness “not as a single statement, but as a set of several (or perhaps many) statements, each reflecting the evaluative criteria applied by the various constituencies involved to a greater or lesser degree with the focal organisation” (Connolly et al., 1980, p. 213). This model may be appropriate for talent systems where there are multiple organisations collaborating at macro and meso levels, and stakeholders operating internal and external to the talent system (e.g., athletes and parents respectively). This model was initially proposed to counter the short-comings of the Goal and System Resource models, deeming it is inadequate to evaluate organisations based on singular criteria with a singular conclusion of effectiveness (Connolly et al., 1980). However, this approach to evaluating

effectiveness is broad and has the potential to be overly complex in practice, especially if different organisations and stakeholders hold incompatible measures of effectiveness. The increased complexity of multiple measures of effectiveness from multiple constituencies may make it difficult to implement meaningful systemic changes if disagreements arose concerning the relative (in)effectiveness of elements of the talent system.

Given the limitations of the singular models of organisational effectiveness in potentially providing a framework for talent system effectiveness, a combined model approach may be most appropriate in assessing talent system effectiveness (see example in Figure 2.6). Multidimensional models may combine or take elements from various models of organisational effectiveness to suit the context in which effectiveness is being evaluated (Chelladurai, 2014). Combining different models of organisational effectiveness may allow evaluation at any given point, and allow for multiple and different effectiveness statements to be given about the talent system from the perspectives of multiple stakeholders.

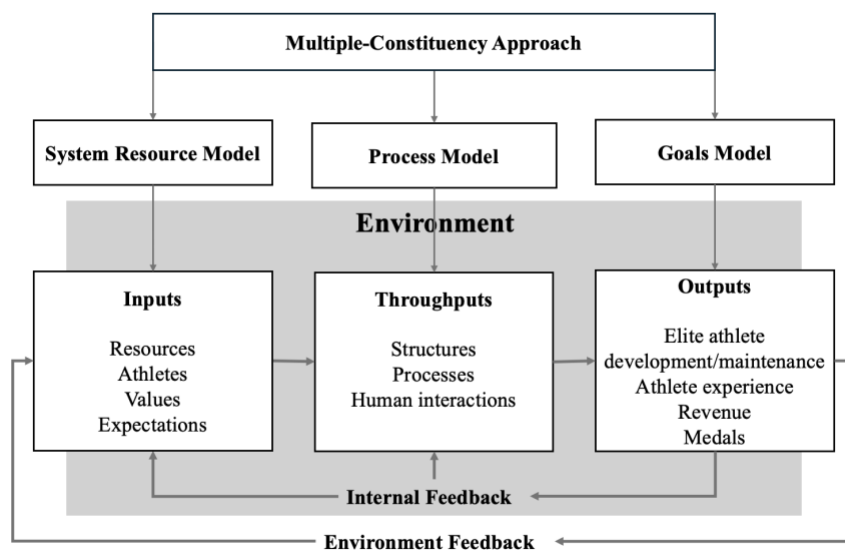


Figure 2.6 An example of a multidimensional model of organisational effectiveness.

Note - Internal feedback refers to Process model evaluation; Environment feedback refers to constraints of the environment in both Process and Resource Models

Based on the emphasis of developing junior athletes to progress and compete at senior elite level (Vaeyens et al., 2008), talent systems would seem to primarily adopt a Goal Model approach. However, given the limited number of athletes who may be considered to be gifted (Gagné, 2005), the System Resource model is relevant as a talent system is unlikely to be effective if those athletes are not initially identified and enrolled. This may be especially true of professional sport talent systems, whereby clubs are effectively in competition to source the best players. Given that developmental processes are a central component of any talent system, with calls to move away from just considering the ‘output’ of talent systems (Williams & MacNamara, 2020), it is important to also consider the Process Model approach. Considering that talent systems are comprised of multiple organisations operating in collaboration (i.e. NGB, league organisers, professional clubs, TDEs), understanding effectiveness of the individual organisations and the collective talent system is an important consideration. As such, the Multiple-Constituency approach is also appropriate.

A constraint of the multiple-constituencies approach to organisational effectiveness is that the different constituencies contributing to an organisation may have conflicting effectiveness goals, or resources may be limited to achieve all desired goals. As such, there may be a need for organisational goals to be considered in a hierarchy to help prioritise differing measures of effectiveness. For example, within a TDE, a coach’s effectiveness may be based upon short-term goals such as competition results, whereas the academy’s effectiveness may be based upon long-term goals such as number of junior athletes to progress to the senior level. The Performance, Outcomes, Processes model (Collins et al., 2019) suggests a hierarchical structure through which the approaches and processes encompassed by TD may contribute to the desired outcomes. Eventual performance is the ultimate goal of a talent system, as such the processes and outcomes of the talent system need to align to this target. In the prior example concerning the differing short-

term goals of a coach versus the long-term goals of the academy, the ultimate goal of eventual performance would suggest that the coach's competition goals would be lower in the hierarchy.

#### 2.3.2.2 *Efficiency*

Compared to effectiveness, evaluating the efficiency of an organisation is a somewhat simpler task, considering the ratio between the inputs of the organisation and the outputs (Bayle & Madella, 2002). Achieving a level of efficiency is important for talent systems and organisations where resources are finite. Efficiency may be measured in quantifiable inputs and outputs, such as financial investment versus return on investment, or athletes enrolled into a talent system versus athletes to reach the senior elite level, or cost per athlete developed. In professional sport contexts, cost of development may be a significant consideration to assess the relative cost benefit of junior player development versus purchasing senior players (Anderson & Miller, 2011).

A commonly used measure of efficiency in sport contexts are athlete conversion rates from junior to senior performance, a frequently used metric in research (e.g., Brustio et al., 2023) and in practice. Conversion rates can be defined as the proportion of athletes who progress from initial selection, or stages of the talent system, to elite senior status in the sport. However, in their simplicity, conversion rates can easily be misinterpreted without context. For example, a frequently cited statistic is that 97% of English soccer academy players do not progress to make an appearance in the English Premiership league (Cunningham, 2022), which is construed as a negative outcome of the talent system. However, the English soccer talent system is typified by large cohorts of players and initial identification and selection occurs from as young as six years of age (Read et al., 2016). As such, in this context, it is therefore unsurprising that conversion rates are often considered small (Sweeney, MacNamara, et al., 2023). An alternate framing of this low conversion rate is that the English soccer talent system has offered opportunity for large numbers of players and, by

definition, only a very few can ever reach the elite level. It should, of course, be a concern if ineffective practice leads to maladaptive outcomes for participants. In this sense, the context of the sport and talent system need to be appreciated when evaluating efficiency rather than just one quantification.

Baker (2022) outlined the striving accuracy paradox, suggesting that to function effectively talent systems require the support of many athletes who will ultimately not progress to the senior elite level to challenge the development of the few who do eventually progress. Combined with the inaccuracy of early talent identification, it is unlikely a talent system will be able to achieve high absolute efficiency levels. Therefore, talent systems may inherently be ‘inefficient’, requiring significant input for limited output.

An organisation evaluating their efficiency may need to a comparison to determine whether the level of efficiency is exceeded and/or acceptable in their context. This comparison could be made using intra-organisational data (e.g., organisation conversion rates over time), or inter-organisational data (i.e. between organisations). Context is vital for such comparisons, considering factors such as impact of differing sport policies over time, or differential selection policies between organisations. For example, different clubs may have different constraints impacting senior athlete selection thus influencing their conversion rate. Comparisons may be made between sports of levels of performance; however significant caution should be exercised. For example, despite both justifiably considered elite (McAuley et al., 2022), comparisons between international and professional sport may be inappropriate as senior athlete recruitment criteria differ. The interpretation of efficiency metrics should therefore take into account the specific sport, the considered demographic size (e.g., total athletes enrolled in a talent system; Bennett et al., 2023),

the capacity for progression within an organisation (e.g., senior athlete turnover), and the level of ‘eliteness’ considered (e.g., Güllich et al., 2023).

Reflective of the broader literature in this domain, research of the efficiency and/or effectiveness of talent systems is retrospective. Of course, assessment of the outcomes of TD necessitates it to be retrospective. However, ongoing, longitudinal data collection and analysis may allow for a comprehensive evaluation of the current practices and processes of TD. When judging the effectiveness and efficiency of talent systems, a nuanced understanding of the context of the talent system is vital. In complex talent systems with multiple macro and meso organisations, operational definitions of effectiveness and the relative efficiencies are likely to vary. As such, depending on perspective, it is possible for multiple conclusions to be drawn from a single talent system, and evaluations of efficiency and effectiveness will have limitations. This underscores the approach of this thesis, evaluating efficiency and effectiveness from multiple standpoints (outcomes, processes, and stakeholder perspectives) to account for such complexity.

## **2.4 Talent development in rugby union contexts**

### ***2.4.1 Rugby union research***

Having reviewed the general TD concepts and evaluative frameworks, highlighting the complexity of talent systems, it is important to consider the specific research pertaining to TD in rugby union. As in other sports, TD in rugby union is a complex and multifaceted process. Given the physicality of the sport, it is unsurprising that much of the research into rugby union has focused on the physical attributes of players (e.g., Dimundo, Cole, Blagrove, Till, et al., 2021). In this regard, comparisons have been made between positions (Zabaloy, Giráldez, et al., 2022), playing levels (Argus et al., 2012), and how physical characteristics of the game have evolved over time with rule changes

(Bevan et al., 2022). It is also unsurprising there is such a research interest in the physical characteristics of junior athletes, considering what qualities distinguish between levels of performance (Green et al., 2011), between age groups (Durandt et al., 2006), between academy and school players (Jones et al., 2018), and between nations (Spamer, 2009). Through profiling various playing populations, this research has been used to inform athlete development by identifying the gap in physical performance to be bridged between junior and senior performance levels. However, much of this research is typified by cross-sectional research designs. Whilst such research may be useful for benchmarking athletes, these designs offer limited insight into an individual's development over time. Reflecting the well documented challenges of longitudinal research, studies which have considered changes over time (e.g., Barr et al., 2014; Casserly et al., 2020; McHugh et al., 2021; Ungureanu et al., 2022) are characterised by small sample sizes, increasing the context specificity of findings and potentially limiting transferability to the English rugby union context.

Research examining the physical demands of the rugby union has also dominated the field. This research has focused on the differences between positions (Cunningham et al., 2016), between junior and senior performance (Cunningham et al., 2016), between playing levels (Jones et al., 2019), and schoolboy to academy rugby (Read et al., 2018). Investigating the training load of English school, club and regional academy players across two age categories (U16 and U18), Phibbs et al. (2017) observed that training load increased with age grade across the three playing standards. Comparisons between playing levels indicated that training intensities (i.e. rate of perceived exertion, relative distance, and PlayerLoad™) were highest in the academy groups and lowest in the school groups across both age categories, suggesting that demands of field-based training sessions increase with age and playing standard in adolescent rugby union players.

However, as highlighted in Chapter 1, in the context of English junior rugby union, players are typically involved in school, club, and regional training programmes concurrently.

Reflecting on the arguments made previously in this chapter concerning coherence between concurrent environments, Phibbs et al. (2018) described British adolescent rugby union as ‘organised chaos’, observing weekly training loads could vary more week-to-week for the same player than between players. The observed positive relationship between match frequency and training load in schools may indicate a focus on match preparation over long-term development (Phibbs, Jones, Roe, et al., 2018b). These comparative studies overall highlight the need for coherence and collaboration. Training load research highlights the necessity for coherence and collaboration between the multiple TDEs to limit the negative effects which may be associated with a lack of coordination. However, like physical characteristics, studies considering game demands are typically cross-sectional. Again, whilst providing useful reference data, observing the differences between the various groups, and highlighting the scale of the developmental challenge, the studies offer little from a development perspective.

As previously discussed, RAEs may be a byproduct of selection biases, and have received considerable research attention in rugby union contexts (Kearney, 2017a, 2017b; Kelly, Jackson, et al., 2021; Kelly, Till, et al., 2021; Kelly, Jackson, et al., 2022; McCarthy et al., 2016; McCarthy & Collins, 2014). In rugby union, RAE differences have been examined in relation to playing positions and sociocultural contexts among senior players, however the findings appear to be somewhat inconsistent (Brustio, Kelly, et al., 2022; Kearney, 2017b, 2017a). Whilst RAE positional differences have not been investigated in rugby union junior cohorts, nor comparatively between junior and senior selection, RAEs have been shown to be prominent throughout male age-grade cohorts (Kelly, Jackson, et al., 2022), to shift with domestic and international cut-off dates

(Kelly, Jackson, et al., 2021), and for a RAE reversal to occur upon selection into senior cohorts (McCarthy & Collins, 2014). Typically, RAE is considered through the lens of ultimate athlete progression. Whilst demonstrating that birth quartile has an impact on the input and output of athletes in talent systems, limited research has attempted to demonstrate how RAEs influence the process of development. In a mixed methods study, Lewis et al., (2015) reported that rugby union coaches may primarily base selection decisions on physical characteristics and overemphasise the importance of game performance during age-grade competitions, potentially contributing to the prevalence of RAEs in Welsh rugby union. As such, there is a need to move beyond considerations of how RAE impact the output of talent systems and consider how an athlete's developmental experience is impacted.

Research has also considered an array of other player characteristics such as cognitive skills (Sherwood et al., 2019), coping skills (Rumbold et al., 2020), technical skills (Plotz & Spamer, 2006; Spamer, 2009), psychosocial characteristics (Turner et al., 2024), psychobehavioural factors (Sheard & Golby, 2009), as well as the impact of injury (Palmer-Green et al., 2013, 2015). The majority of rugby union studies have considered these as discrete factors, although research is beginning to consider how multiple factors may impact development concurrently (Dimundo, Cole, Blagrove, McAuley, Till, & Kelly, 2021; Dimundo et al., 2022). Overall, much of the research is focused on the micro-level of the talent system. Research on the meso-level is becoming more prevalent, considering the features and operations of rugby union TDEs (Costello et al., 2022; Taylor, Ashford, et al., 2022). However, it is focused on individual TDEs rather than the network of TDEs within the talent system.

Whilst this previous research in rugby union lay important groundwork in contextualising the sport and indicates areas of future consideration, the current research able to inform rugby union sport

policy is somewhat limited. In essence, much of the research into rugby union TD would seem to be limited by research design and sample size. This poses a challenge to macro system organisations aiming to promote effective features of TD and support practice as it may be difficult to extrapolate and apply information across a broad context. Regarding the previous discussion of the importance of resources in talent systems, the current body of literature does little to inform resource allocation or how it may influence development in rugby union contexts. As such, there is a need for more comprehensive research that not only captures the complexity of TD in rugby union but also is designed to generate actionable insights to guide strategic decision-making and resource allocation within sport policy frameworks.

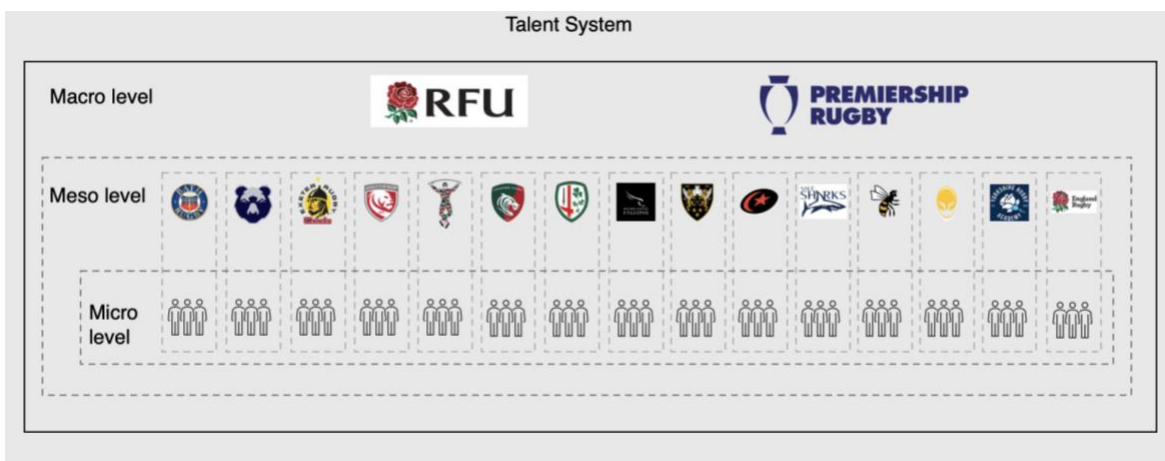


Figure 2.7 English rugby union talent system structure

Figure 2.7 depicts the structure of English rugby union talent system through macro, meso, and micro lenses. Considering the literature previously presented, it is evident that much of its focus is on the coaches and athletes at the micro-level. Whilst this is important and can inform good practice which promotes TD, it does little to inform how good practice can be promoted at the macro-level. Otherwise, as previously stated, the current body of research provides limited guidance for the design of the talent system or resource allocation. Most studies are narrow in scope (singular TDE

contexts, small samples) and cannot be generalised across the English talent system. Reflecting these limitations, this chapter has highlighted the complexities of the design and resourcing of talent systems, and the need to consider the macro, meso, and micro-levels in talent system evaluation. Therefore, to be able to inform the design and resourcing of the talent system a more comprehensive, system-wide evaluation is needed, one which examines the historical effectiveness of talent system policies against their intended outcomes and the efficiency of the processes used to achieve these outcomes.

## **Chapter 3: The impact of high-potential status on progression and conversion within a male rugby union talent system**

Shelley, A., Taylor, J., MacNamara, Á., Sajwan, V., Scriney, M., McCarthy, N., Jones, B., & Behan, S. (2025). The impact of high-potential status on progression and conversion within a male rugby union talent system. *Journal of Sports Sciences*, 43(4), 348–359. <https://doi.org/10.1080/02640414.2025.2458357>

### **3.1 Introduction**

As presented in Chapter 2, sport talent systems are a network of environments designed to support and accelerate the progress of high-potential young athletes to reach senior elite status (Vaeyens et al., 2009). Many professional sporting organisations have established TD academies to support the development of young athletes towards senior elite performance, investing significant resources into identification, selection and development (Abbott & Collins, 2004; Till & Baker, 2020). Although research has examined the design of these systems (Bailey & Collins, 2013; Bergeron et al., 2015; Erikstad et al., 2021), there remains a need to understand their effectiveness and efficiency. As outlined in Chapter 2, Bayle and Madella (2002) defined effectiveness as the ability to achieve institutional goals (e.g., the development of senior athletes and additive value to the lives of all participants), whilst efficiency compares the ratio between the system inputs and the outputs produced. Expanding upon this, Taylor and colleagues suggest talent system efficiency is reflected in the use of necessarily limited resources (e.g., finances, time, and focus) to achieve desired objectives (Taylor et al., 2022). The dilemma of resource allocation has motivated some systems to maximise efficiency by focusing resources on a small select group of early identified athletes (Johnston & Baker, 2020) despite the efficacy of early talent identification models being strongly

challenged (e.g., Abbott et al., 2005; Bailey & Collins, 2013; Till & Baker, 2020). In this sense, a strategy focused on the development of an early identified few is likely to be neither highly efficient nor effective. Reflecting this, there are increasing calls for systems to adopt the aforementioned principle of keeping ‘as many as possible, for as long as possible’ (Erikstad et al., 2021). Yet, given the limitations of resource and associated efficiency implications, this is far from a straightforward balance. Reflecting Taylor et al.’s premise that talent systems have necessarily limited resources to achieve their objectives, this presents a complex and ongoing problem. All talent systems are limited by time and attention; therefore, strategic decisions have to be taken considering the resourcing needs of high-potential athletes. Therefore, there is a need to consider resource allocation from both an efficiency and effectiveness perspective (Taylor et al., 2022).

### ***3.1.1 Conversion rates***

As discussed in Chapter 2, a common metric cited in TD literature (e.g., Brustio et al., 2023) and practice (e.g., NFL Football Operations, n.d.) is ‘Conversion Rate’, the ratio of athletes who progress from initial selection, or stages of the talent system, to elite senior status in the sport. Conversion rates will depend upon the considered demographic size (e.g., total athletes enrolled in a talent system; e.g., Bennett et al., 2023), the capacity for progression (e.g., senior athlete turnover), and the level of ‘eliteness’ considered (e.g., Güllich et al., 2023). In isolation and without context, conversion rates do not reflect the complexity of TD. Subsequently, they must be used judiciously. As discussed in Chapter 2, conversion rates must consider the context of the talent system to draw appropriate and informative insights. Talent systems which include large participation numbers, influenced by age of initial selection and number of TDEs, may have inherently low conversion rates. As previously exemplified in Chapter 2, the English Premier League had a reported 3% conversion rate when considering academy conversion of players aged as young as seven years old (Cunningham, 2022). Conversely, if the conversion rate calculation is

based on athletes who have already gone through multiple rounds of selection (e.g., have progressed through English soccer academy phases), the conversion is likely to be higher. In rugby league, for example, Till et al. (2014) reported that 12.1% of players selected into pre-academy programmes between 2005-2007 reached the senior professional level, but this increased to 21.1% when delimited to those who were selected into academies. As such, when considering conversion rates it may be beneficial to consider calculations both through *absolute* and *relative* lenses. Absolute conversion rate, considering the proportion of athletes to progress from the talent system population, may reflect the efficiency of the overall talent system by comparing absolute inputs to absolute outputs. Whereas relative conversion rate, considering the proportion of a sub-population to progress, may offer insight into how differential factors such as relative age quartiles (e.g., Kelly et al., 2020), or sub-sections of populations involved in specialised development programmes (cf. Vaeyens et al., 2009), may influence progression.

However, it is important to consider differences within sports and contexts and move away from a tendency to consider sport systems as homogeneous. For example, whilst researchers calculated English Premier League soccer had a 38.8% collective conversion rate of U17-U18 players from 23 academies, conversion rates of the individual academies ranged between 19.7% and 69.7% (Anderson & Miller, 2011). These findings highlight the variability within a talent system, demonstrating that macro conversion rates are not necessarily representative of the meso-level (individual TD environments; TDEs). This is especially pertinent because meso-level conversion can be impacted by the relative strength of senior squads, or practice of coaching teams (e.g., Taylor & Collins, 2021). It is thus important for conversion rates to be calculated at both macro and meso levels for a multidimensional assessment of efficiency and effectiveness (see Table 3.1).

*Table 3.1 Types of conversion rate which may be calculated for a multidimensional perspective*

	Macro Conversion	Meso Conversion
Absolute Conversion	Sum total of players conversion, encompassing all TDEs	Sum total of players enlisted in specific TDEs
Relative Conversion	Subpopulation conversion, encompassing all TDEs	Subpopulation conversion in specific TDEs

Within the literature, the linearity of progression between junior and senior performance levels has been investigated utilising conversion rates. In a multi-sport study, Barreiros et al. (2014) reported that approximately 30% of junior internationals progressed to compete internationally at senior level. Similarly, Bezuglov et al. (2022) reported that whilst higher performing junior athletes were more likely to progress than their less successful peers, 68.5% of successful seniors were not highly ranked in their formative years. A recent meta-analysis has supported this, concluding junior performance has a minimal relationship with later senior performance (Barth et al., 2023). Given findings suggesting that successful juniors and successful seniors are disparate populations (Güllich et al., 2023), it is important to consider the role of youth success in TD and implications of who is retained within the junior talent system. These strategic decisions about who to retain are further complicated by the need for a critical mass of athletes who can support the development and likelihood of others progressing (Baker, 2022b). This may be especially true of team sports where sufficient numbers of players are required in each age grade to allow for match playing opportunities. Therefore, a degree of inefficiency may be an inherent and necessary condition to facilitate effectiveness.

### 3.1.2 *Current study*

As discussed in Chapter 1, player development within English rugby union is delivered through a collaboratively developed strategy between the NGB (RFU) and the professional clubs (represented by PRL). Policies are developed as a collaboration between these two macro system entities and managed through an academy licence agreement. If a player experienced a linear pathway progression, their journey would be selection into a ‘junior academy’ (under 16 to under 18; U16-U18) followed by selection into a ‘senior academy’, a smaller selective cohort of now professional athletes between 18 and 24 years of age. Across the timeline of this study there are fourteen regional academies aligned with the main twelve Premiership clubs, and two Championship clubs. Over the last ten years, variations to the structure of the Premiership league have meant that the ratio of academies to Premiership clubs has altered (i.e. 12 club league, 13 club league). One regional academy, owing to the demise of their associated club (relegation below Championship), was re-established as a standalone academy, operating only a junior academy (U16-U18) and not affiliated to a Premiership or Championship club.

Within the broader talent system and TDEs, it is important to consider the individual level experiences of athletes in understanding efficiency and effectiveness. As discussed in Chapter 2, the early features of an individual athlete’s experience that present either relative advantage or disadvantage have been termed ‘push’ and ‘pull’ factors respectively (Sweeney et al., 2023). It is hypothesised that a dynamic interplay between push and pull factors means that what advantages an individual earlier *may* hinder progress later (McCarthy et al., 2022). A potential push factor that has received little research attention is the act of labelling athletes, conferring them a status as they progress in a talent system (Baker, 2022). It is common practice in education and sporting contexts to assign a label to individuals conveying a perception of their later potential (i.e. ‘gifted’ and/or ‘talented’; Jung, 2022). Whilst research has highlighted that early involvement in talent systems

may not translate into higher senior performance (Güllich & Barth, 2023), how the status (un)afforded to developing athletes involved in such programmes influences the individual level experience and development remains relatively under investigated. English rugby union provides an example of explicitly labelling and conferring status within a sport context through the nomination of ‘England Academy Players’ (EAP). Nominated by their regional academy, EAPs are England eligible players who are deemed to hold the greatest potential for senior elite success of England international representation or the Premiership League, the top-flight domestic competition.

In the junior academy, alongside elevated status explicitly signalling their perceived potential, it is mandated EAPs receive increased resourcing from both England Rugby and their academy, often beyond the provision of their non-EAP age-matched peers within the same cohort. This support includes individualised development plans, detailed seasonal competitive playing opportunities, enhanced medical provision, and for academies to ensure optimal communication between player stakeholders. As such, EAPs may benefit from Matthew Effects, whereby an advantaged group may culminate additional advantage compared to a relatively disadvantaged group (Baker, 2022). It is also plausible that enhanced status of EAPs influences psychosocial dynamics such as expectancy effects (Solomon, 2010), where perceptions and expectations of athletes may result in differential treatment in the form of greater time and attention. This recognition and validation may offer relative early advantages to these athletes, and therefore elevated status may act as a push factor. In addition, based on the role of the coach in selection decisions, EAPs may be presented with more favourable selection opportunities based on perceptions of potential (cf. Christensen, 2009).

EAPs may be nominated whilst in the junior academy, accounting for a small proportion of the cohort (approximately five EAPs per ~30-50 academy players; Till et al., 2020). Otherwise, if selected into the senior academy post U18, achieving a senior contract, all English qualified players become an EAP until the age of 24. This means there are two types of EAP: those recognised as high-potential early, having benefited from the status in the junior academy, and those who are recognised late, not being labelled until they attain a senior contract post U18 (please see Figure 3.1).

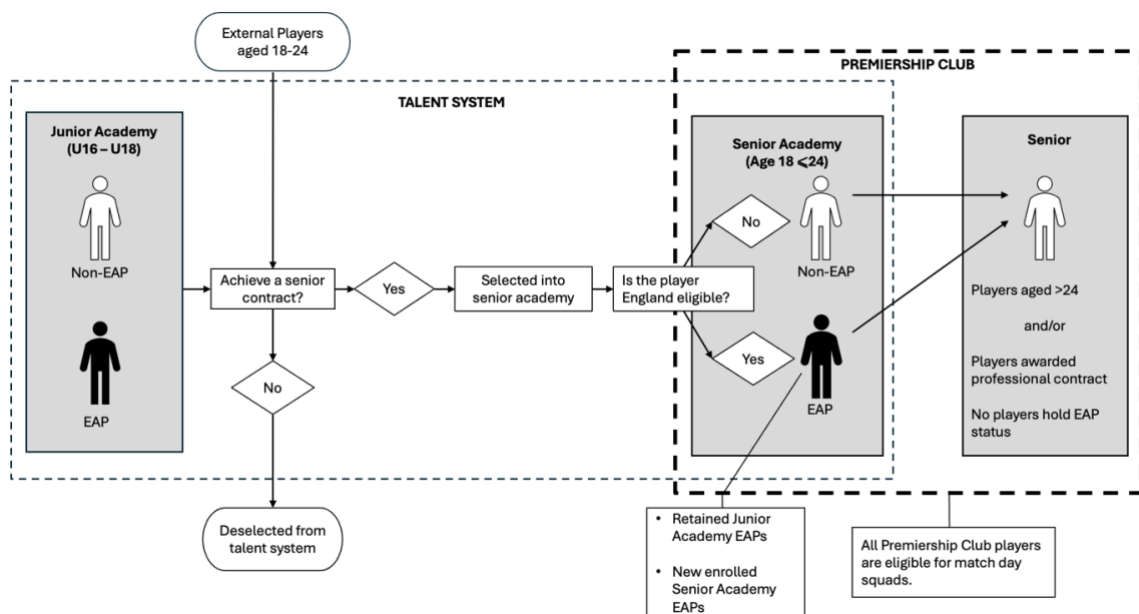


Figure 3.1 Diagram depicting the EAP process in the English rugby union talent system.

As such, the English rugby union talent system provided a unique context to explore one of Baker et al. (2018)’s propositions, that “beliefs about talent matter” (p. 51), specifically how perceptions of talent, and explicitly granting athletes high-potential status, may influence the dynamics of athlete development. In addition, given the significant resourcing of EAPs, there was a need to investigate the impact of this strategy. This study therefore aimed to investigate the conversion rate of male rugby union academy players into the Premiership and the potential influence of EAP status. Specifically, the purpose of this study was to: (a) calculate and compare the conversion of players into the Premiership (as marked by their debut appearance) between EAP status subtypes;

(b) calculate and compare the conversion of EAPs to the Premiership (as marked by debut appearance) between the 14 regional academies, considering each academies contribution to net development; (c) compare the likelihood of EAPs and Non-EAP academy players making a Premiership via inferential statistics; and (d) investigate the influence of timing of status acquisition on the likelihood of achieving a Premiership debut appearance.

## **3.2 Materials and methods**

### **3.2.1 Data collection**

Using retrospective analysis of the academy system and the English Premiership league, data was sourced from junior academy and EAP registration lists of all 14 regional academies (seasons 2010/11 - 2022/23) and senior club registration lists from 13 Premiership clubs (seasons 2014/15 - 2022/23) provided by Premiership Rugby Limited (PRL). Out of a possible 182 junior academy registration lists and 182 EAP registration lists, 129 and 181 were accounted for respectively. All 110 Senior Club registration lists were accounted for.

Comprehensive match appearance data spanning 1998/99 - 2022/23 (last match 30/09/22) was provided by PRL. The match appearance dataset detailed Premiership appearances of ex-academy players and did not include players entering the academy system from external sources (e.g., non-English clubs). PRL anonymised all player names with unique identification codes; researchers combined registration and match appearance datasets by cross referencing the identification codes. The study dataset contained information pertaining to player date of birth, EAP status, club/academy history, position, and Premiership appearances (if applicable). The full study dataset included a total of 11,558 unique male players. Ethical approval was obtained from the institutional Research Ethics Committee.

### **3.2.2 Participants**

#### *3.2.2.1 Inclusion/exclusion criteria*

Players without birthdate information and those whose first year of registration was unknown were excluded from the sample. Players first enrolled in the system prior to the 2012/13 season were excluded, removing the first two seasons after EAP policy instantiation (2010/11 and 2011/12). During this period Premiership players aged 18-24 years of age who had already debuted would have been conferred as an EAP, thus their Premiership debut would not have been potentially influenced by the status, skewing the dataset. Players newly registered in the 2022/23 season were excluded given the dataset only captured twelve fixtures of the 2022/23 season. Players older than 24 years of age on first chronological entry into the dataset were excluded; only players who were of an academy age ( $\leq 24$  years old) when they first appeared in the registration lists were included in analysis. As match data did not include players who had transferred into the senior academy from an external context, it was not possible to ascertain whether they achieved a Premiership debut; these players were excluded from analysis. Finally, players younger than 19 years of age on 30/09/2022 (the last Premiership match of the dataset) were excluded. This removed newly contracted senior players under 19 who typically would not yet have made a Premiership debut (of the 1640 removed players, zero had debuted). Please see Figure 3.2 for visualisation of this process with the number of excluded players at each stage. The final sample consisted of 3127 players.

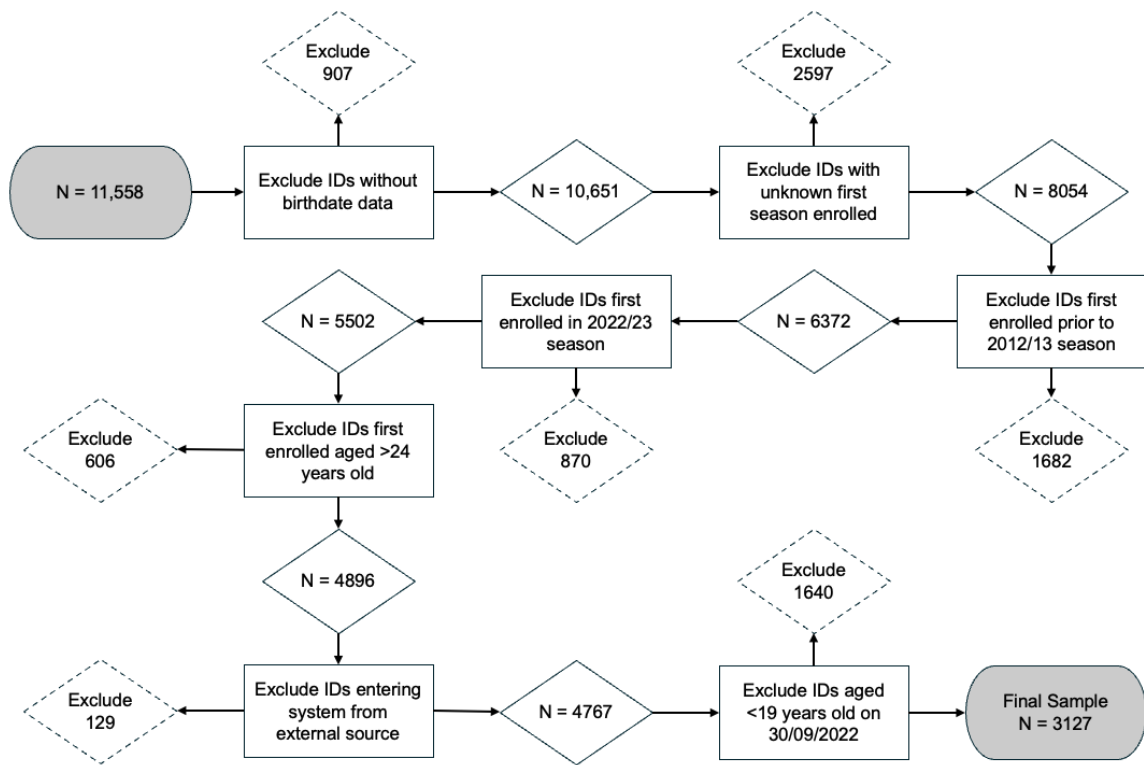


Figure 3.2 Flowchart of exclusion criteria applied to the dataset to determine the participant sample

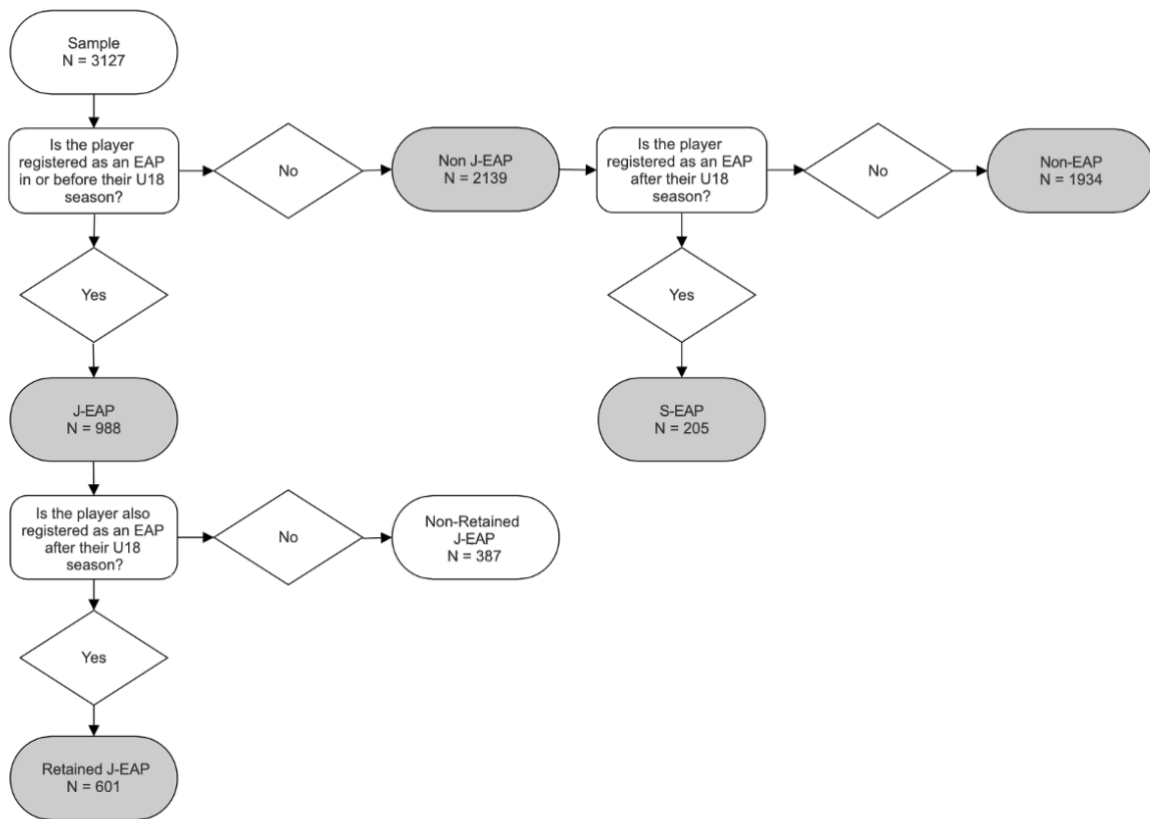


Figure 3.3 Flowchart depicting the categorisation of participants into analysis groups

### 3.2.2.2 *Final sample*

The final sample was sorted into three groups based upon if/when they were first nominated as an EAP. The season of a player's first occurrence in an EAP registration list determined their 'EAP season'. Using birthdate data and September 1<sup>st</sup> to August 31<sup>st</sup> cut off dates, it was calculated how old the player would be by the end of the season; for example, players born between 01/09/2000 and 31/09/2001 would have turned 16 in the 2016/17 season. Junior academy nominated EAPs (J-EAPs) were nominated in or before the season they turned 18 years old (n=988). Senior academy enrolled EAPs (S-EAP) first became an EAP in or after the season they turned 19 years old (n=205). Non-EAPs (n=1934) are players who were never nominated. The process of categorising players between groups can be observed in Figure 3.3. Importantly, S-EAP is a group only containing players selected into the senior academy, whereas J-EAP and Non-EAP groups both contain players selected into the senior academy and deselected from the junior academy. As such S-EAPs should not be directly compared to these groups. To create a comparison group, J-EAPs who remained in EAP registration lists post their U18 season were identified in the sample (Retained J-EAP; n=601).

### 3.2.3 *Analysis*

To calculate conversion rate of the overall sample, the percentage of academy players achieving a Premiership debut (playing >1 minute in a Premiership match) were examined overall and between subpopulations (Non-EAP, EAP, J-EAP, S-EAP, Retained J-EAP). These conversion rates were calculated on three levels: *Relative*, which considered the number of participants within a subpopulation to make a debut; *Absolute*, which considered the subpopulation conversion in relation to the whole sample; and *Adjusted Absolute* reported the subpopulation conversion in relation to the debuting players. Equations for calculating conversion rates are as follows:

- $Absolute\ conversion\ rate = (Debuting\ Population \div Total\ Population) \times 100$

- *Relative conversion rate* =  $(\text{Debuting Subpopulation} \div \text{Total Subpopulation}) \times 100$
- *Absolute conversion rate* =  $(\text{Debuting Subpopulation} \div \text{Total Debuting Population}) \times 100$

To compare the regional academies, only EAPs (J-EAP and S-EAP) who could be attributed to a specific junior academy during their U18 season were sampled (n=860). Assessing a measure of efficiency, meso-level relative conversion rates were calculated by comparing each academy's number of EAPs to the number who debuted in the Premiership with any club. Overall macro conversion rate was also calculated with this sample for additional comparison. Considering the total number of debuting EAPs from this sample (n=257), each academy's contribution to the net development of Premiership players was assessed by tracing which academy these players were registered with at U18 - thus demonstrating comparative academy effectiveness.

### **3.2.4 Statistical analysis**

Odds Ratios (ORs) and 95% Confidence Intervals (CI) were calculated to compare the likelihood of participants achieving a Premiership debut between EAP status categories. ORs were calculated comparing all EAPs (J-EAPs and S-EAPs) versus Non-EAPs, J-EAPs versus non J-EAPs (S-EAPs and Non-EAPs; 3.2), and Retained J-EAPs versus S-EAPs (Table 3.44). A binomial regression analysis of all players registered as an EAP at any academy stage was performed to consider the potential influence of age first registered as an EAP, and the total number of seasons enrolled as an EAP, on the likelihood that participants would play in the Premiership. 'Age first enrolled as an EAP' considered the season age of each participant at first EAP registration, whereas 'number of seasons as an EAP' considered the total number of seasons each participant accrued as an EAP. The variables included in the binomial logistic regression model were selected based on theoretical considerations that are relevant to the context of this study. Specifically, the predictors 'age first enrolled as an EAP' and 'number of seasons as an EAP' were chosen because they are hypothesised

to be critical factors influencing the likelihood of participants playing in the Premiership. IBM SPSS Statistics (Version 28) was used for all statistical analysis.

### **3.2.5 Data limitations**

Of all the junior academy data eligible for inclusion, we were unable to obtain 53 registration lists as they were not stored in the PRL's data archive, nor available from the clubs. These missing lists were predominantly from the seasons between 2012/13 and 2015/16. One academy EAP registration list was missing for the 2018/19 season. The missing data is limited to players not achieving a Premiership debut and consists predominantly of Non-EAPs. The one missing EAP registration list means that only non-debuting EAPs registered with Club E for only the 2018/19 season are not captured by the dataset. Therefore, it is unlikely that the missing EAP data will significantly impact the results. The missing data means the OR and 95% CI results presented in this study are likely to be understated. An increase in non-debuting Non-EAPs would increase the ORs in favour of EAPs and J-EAPs. An increase in players not debuting would also impact Non-EAP, non J-EAP and overall sample conversion rates, meaning these conversion rates are likely to be inflated. Due to the missing data, retained Non-EAPs were not included in overall analysis, and academy specific analysis did not include Non-EAPs.

### 3.3 Results

Table 3.2 reports the overall counts of EAP categories and macro conversion rates. The absolute sample conversion rate was 11.70%. EAP categories had a higher relative, absolute, and adjusted conversion rate in comparison to Non-EAPs. EAP category counts as reported in Table 3.2 were used to calculate ORs. EAPs had greater odds of achieving a Premiership debut compared with Non-EAPs (OR: 35.21; CI: 22.71-54.60), with J-EAPs having increased odds over non J-EAPs (OR: 5.82; 95% CI: 4.60-7.37).

Table 3.3 reports EAP retention and conversion rate by age of initial nomination. Of the 988 J-EAPs, 60.82% were selected into the senior academy and remained an EAP<sup>1</sup>. Table 3.4 reports the conversion rate of S-EAPs and Retained J-EAPs. S-EAPs had a greater relative conversion rate compared to Retained J-EAPs. OR calculation reported marginally higher odds of S-EAPs making a Premiership debut compared to Retained J-EAPs (OR: 1.28; 95% CI: 0.93-1.76).

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<sup>1</sup> Seven J-EAPs made a Premiership debut despite not being re-registered as an EAP in the senior academy. Six of these players transitioned into the senior academy but were omitted in ongoing EAP registration lists despite not appearing in EAP release records. These six players likely represent administrative errors made by clubs at the point of registration. The remaining J-EAP was deselected from the junior academy but was contracted to a Premiership club several seasons later, bypassing the senior academy. For this reason, these seven players are included in Table 3.2 and 3.3 analysis but not analyses in Table 3.4.

Table 3.2 Overall descriptive participant data and EAP category macro conversion rates

	Sample (N=)	Debut (N=)	Age of Debut (Mean ± SD)	Relative Conversion	Absolute Conversion	Adjusted Absolute Conversion
Overall Sample	3127	366	20.24±6.61	11.70%	11.70%	-
EAP <sup>1</sup>	1193	344	20.43±1.78	28.83%	11.00%	93.99%
Non EAP <sup>2</sup>	1934	22	21.00±1.77	1.14%	0.70%	6.01%
J-EAP <sup>3</sup>	988	249	19.90±1.35	25.20%	7.96%	68.03%
Non J-EAP <sup>4</sup>	2139	117	21.68±1.98	5.47%	3.74%	31.97%
J-EAP	988	249		25.20%	7.96%	68.03%
S-EAP <sup>5</sup>	205	95	21.84±1.99	46.34%	3.04%	25.96%
Non-EAP	1934	22		1.14%	0.70%	6.01%

<sup>1</sup> England Academy Player; <sup>2</sup> Player never enrolled as an EAP; <sup>3</sup> EAP enrolled ≤U18; <sup>4</sup> Players not enrolled as an EAP ≤U18; <sup>5</sup> EAP enrolled >U18

Table 3.3 Retention and conversion of EAPs by age of initial EAP nomination

	Age of nomination	Total (N)	Senior Academy Retention (N)	Premiership Debut (N)	Senior Academy Retention	Junior Academy/Premiership Conversion Rate	Senior Academy/Premiership Conversion Rate
Junior Academy	≤U15	86	44	18	51.16%	20.93%	40.91%
	U16	339	185	91	54.57%	26.84%	49.19%
	U17	336	187	68	55.65%	20.24%	36.36%
	U18	220	185	65	84.09%	29.55%	35.14%
Senior Academy	U19	87	-	29	-	-	33.33%
	U20	42	-	22	-	-	52.38%
	U21	21	-	11	-	-	52.38%
	U22	34	-	21	-	-	61.76%
	U23	17	-	10	-	-	58.82%
	U24	4	-	2	-	-	50.00%

Table 3.4 Macro Conversion rates of Retained J-EAPs and S-EAPs, and overall senior academy

	Total (N)	Debut (N)	Age of Debut (Mean ± SD)	Relative Conversion Rate (%)	Absolute Conversion Rate (%)	Adjusted Absolute Conversion Rate (%)
Retained J-EAP	601	242	19.92±1.34	40.27%	30.02%	71.81%
S-EAP	205	95	21.84±1.99	46.34%	11.79%	28.19%
Total	806	337		41.81%	41.81%	-

Table 3.5 reports the number of EAPs traced to each academy at age grade U18. Whilst the overall conversion of this sample was 29.88%, academy conversion rate varied between 14.63%-45.28%. Each academy's contribution to net development of Premiership players is reported in Table 3.5

*Table 3.5 Academy EAP (J-EAP and S-EAP) conversion into Premiership and contribution to net development of Premiership players*

	EAP (N=)	Debut (N=)	Meso Relative Conversion	Contribution to net development
Club A	63	16	25.40%	6.23%
Club B	95	23	24.21%	8.95%
Club C	58	20	34.48%	7.78%
Club D	56	10	17.86%	3.89%
Club E	41	6	14.63%	2.33%
Club F	53	24	45.28%	9.34%
Club G	116	33	28.45%	12.84%
Club H	55	17	30.91%	6.61%
Club I	49	18	36.73%	7.00%
Club J	57	22	38.60%	8.56%
Club K	61	19	31.15%	7.39%
Club L	46	20	43.48%	7.78%
Club M	40	7	17.50%	2.72%
Club N	70	22	31.43%	8.56%
Total	860	257	29.88%	100%

### **3.3.1 Regression analysis**

A binomial logistic regression was performed to ascertain the influence of age first enrolled as an EAP, and number of seasons accrued as an EAP on the likelihood that participants would play in the Premiership. Linearity of the continuous variables with respect to the logit of the dependent variable was assessed via the Box-Tidwell procedure (Box & Tidwell, 1962). A Bonferroni

correction was applied using all five terms in the model resulting in statistical significance being accepted when  $p < .01$  (Tabachnick & Fidell, 2014). Based on this assessment, all continuous independent variables were found to be linearly related to the logit of the dependent variable. The area under the ROC curve was 0.934 (95% CI, 0.919, 0.950), which is an outstanding level of discrimination according to (Hosmer Jr et al., 2013).

Multicollinearity was assessed by examining the Variance Inflation Factor (VIF), Tolerance values, and the correlation between the predictors. The correlation between age first enrolled as an EAP and seasons spent as an EAP was 0.622, indicating a moderate positive relationship between these variables. However, the VIF values were below 5 for both predictors (VIF for age first enrolled as an EAP = 2.092, VIF for seasons spent as an EAP = 2.092), suggesting that multicollinearity is not a significant concern. Tolerance values were above 0.2 for both predictors, further supporting the absence of problematic multicollinearity.

There were eight standardised residuals with values ranging from 2.601 to 3.302 standard deviations. These were inspected further, four were discarded and four were kept in the analysis. The logistic regression model was statistically significant,  $\chi^2(2) = 744.317$   $p < .001$ . The model explained 66.4% (Nagelkerke  $R^2$ ) of the variance in Premiership debuts and correctly classified 87.7% of cases. Sensitivity was 76.2%, specificity was 92.3%, positive predictive value was 80.1% and negative predictive value was 90.5%. Both predictor variables were found to be statistically significant: age first enrolled as an EAP, and seasons spent in the academy as an EAP (as shown in Table 3.6). Participants who were enrolled as an EAP at a younger age had 2.501 times higher odds. Increasing seasons spent in the academy system as an EAP was associated with 3.855 higher odds of players likelihood of playing in the Premiership. To sense check these findings, J-EAPs who were nominated at age 15 were identified in the dataset (N=83). Of these 83 players, 43 were

retained into the senior academy and 18 debuted in the Premiership (U15 J-EAP conversion = 21.69%; U15 Retained J-EAP conversion = 41.86%).

*Table 3.6 Binomial Logistic Regression predicting likelihood of Premiership debut based upon age first enrolled as an EAP and seasons spent in the EAP academy system*

	B	S.E.	Wald	df	Sig.	Odds Ratio	95% C.I. for Odds Ratio	
							Lower	Upper
EAP Age	0.917	0.066	190.559	1	<.001	2.501	2.196	2.849
EAP Seasons	1.349	0.081	277.295	1	<.001	3.855	3.289	4.518
Constant	-21.701	1.412	236.244	1	<.001	0.000		

### 3.4 Discussion

#### 3.4.1 Aims

The aim of this chapter was to investigate the conversion rate of rugby union academy players into the Premiership and the influence of EAP status. Specifically, this study aimed to: a) calculate and compare the conversion of players into the Premiership (as marked by their debut appearance) between EAP status subtypes; (b) calculate and compare the conversion of EAPs to the Premiership (as marked by debut appearance) between the 14 regional academies, considering each academies contribution to net development; (c) compare the likelihood of EAPs and Non-EAP academy players making a Premiership debut via inferential statistics; and (d) ) investigate the influence of timing of status acquisition on the likelihood of achieving a Premiership debut appearance

#### 3.4.2 Conversion rates

##### 3.4.2.1 Subpopulation conversion rates

Whilst EAP status seems related to the promotion of junior academy players into the senior academy, with a 60.82% retention rate of J-EAPs, the relative conversion of Retained J-EAPs is less than that of players first made an EAP in the senior academy (40.27% and 46.34%

respectively). Therefore, the effectiveness of the EAP status in promoting senior elite performance may be limited. In terms of efficiency, more than one in four players who were conferred EAP status in the junior academy and as a consequence received additional resourcing compared to non J-EAP age matched peers, later debuted in the Premiership. This, along with the 68.03% of Premiership players in our sample having been a J-EAP, denotes a level of efficiency. However, this approach to efficiency is simplistic as the resource invested into these players has not been considered, nor has a return on investment beyond a single Premiership appearance.

Linearity between junior and senior performance has been widely disputed across a range of contexts and sports. Research has widely reported that whilst high performing junior athletes were more likely to progress, they were less likely to be amongst the highest performing seniors (Barreiros et al., 2014; Barth et al., 2023; Bezuglov et al., 2022; Güllich et al., 2023). Reflective of this, J-EAPs (representing the ‘best’ junior academy players) had a high retention into the senior academy, but had a lower relative conversion from the senior academy into the Premiership, and decreased odds of debuting, when compared to S-EAPs - players who were not considered to be the ‘best’ in the junior academy. However, J-EAPs accounted for the majority of Premiership debuts as reflected in absolute relative conversion rates and overall had increased odds of debuting compared to non-EAP junior academy players. In English rugby union, whilst the EAP status is reserved for the ‘best’ players in the system (Till et al., 2020), ‘best’ is conceptualised by perceived potential and future performance rather than just current performance. This is a fundamental difference between the research presented in this current study compared to the wider literature which has historically considered the individual’s absolute junior performance outcomes (Barth et al., 2022; Bezuglov et al., 2022; Güllich et al., 2022; Güllich & Barth, 2024). It also points to the significant contextual difference between junior international representation and selection into an academy setting in professional sport. While this is not to suggest that rugby union coaches are

significantly better at talent identification than other systems, it may be the case that the relatively delayed selection policies of rugby union enhance accuracy, or that the perception of potential and subsequent support has a significant developmental impact. Either way, these would seem fruitful avenues for further research.

#### *3.4.2.2 Academy conversion rates*

Substantial variation in efficiency and effectiveness was observed between the academies. This is a notable finding, suggesting that the academy a player is registered at is an important factor in terms of likely conversion. The environment features as process markers of effectiveness of TD have received research attention (Hauser et al., 2022; Martindale et al., 2007). Rather than quantifying the quality of the TDE on outcome and conversion rate, the focus of much literature has been on investigating the features which may explain this outcome (e.g., (Henriksen et al., 2010a, 2010b; Larsen et al., 2020). Given the meso-level variability evident in these findings, it is important to consider and examine differences in the environment features of the rugby union academies to understand this variability and to explain why some academies were more efficient and/or effective than others. Reflecting earlier comments about the need to understand the nuances of conversion rates, it is important to move beyond the absolute ‘production’ of a TDE (Williams & MacNamara, 2020). One area of future consideration may be the influence of resource allocation across different academies within the same system. Whilst the English rugby union regional academies receive central funding and are required to meet minimum operating standards, academies may choose to invest additional resources into their system. An academy’s strategic use of these resources may influence their ability to provide an effective TDE and influence the number of players and EAPs they can effectively resource and develop. In turn, this investment is likely to influence conversion rate and contribution to net development. Further research from both

quantitative and qualitative perspectives is warranted to understand the range, extent and influence of the contextual factors on talent processes and strategy in English rugby union academies.

### **3.4.3 EAP status**

EAP status was associated with an increased likelihood of Premiership debut, with ORs revealing that EAPs had 35.21 increased odds of achieving a Premiership debut over Non-EAPs, and J-EAPs had 5.82 increased odds over non J-EAPs. J-EAPs also had the greatest absolute conversion rate, accounting for 68.03% of debuting players. The mandated individual development plans and increased communication between stakeholders may help to influence and manage the exposure to challenge that J-EAPs experience along their pathway (cf. Moodie et al., 2023). This, along with increased expectancy effects possibly associated with the label, may facilitate the comparatively high absolute conversion and increased chances of a Premiership debut of this group compared to non J-EAPs.

Notably, S-EAPs had marginally increased odds of attaining a Premiership debut compared to Retained J-EAPs. This may indicate that the increased relative resourcing of J-EAPs during the junior academy is only beneficial to increase their odds of progressing into the senior academy. The transition from junior to senior is often considered the most difficult within an athletic career, with some athletes demonstrating inability to cope with the challenges that it evokes (Stambulova et al., 2007; Taylor & Collins, 2019). Without the additional support and elevated status, S-EAPs may have had to overcome additional challenge during their formative years, which may have tested existing psychobehavioural skill sets (Collins & MacNamara, 2012; McAuliffe et al., 2022). This may partially explain S-EAPs' marginally higher odds of Premiership debut and increased relative conversion rate from the senior academy compared with Retained J-EAPs. This is reflective of a breadth of research suggesting that the early selection advantages experienced by relatively

older players at junior stages of their career are not continued in senior cohorts (McCarthy et al., 2016; McCarthy & Collins, 2014). Instead, across contexts and sports, there appears an advantage reversal whereby relatively younger players are comparatively more likely to sign a senior contract (e.g., Brustio, Stival, et al., 2023; Jones et al., 2018; Kelly et al., 2022). Similarly, the results of this current study suggest that conferring status may provide players an early advantage in the junior academy, acting as a push factor. However, this status may not be as advantageous at later stages of the pathway, specifically after achieving a professional contract and transitioning to the early stages of the senior elite level. Regardless of mechanism, it would appear that Baker and colleagues' (2018) proposition that socially conferred labels do have an impact on athlete development.

The findings indicate that the timing of EAP status acquisition may be an important factor in progression. The 'push' impact of increased seasons accrued as an EAP on likelihood of Premiership debut is a somewhat unsurprising finding as it indicates reselection between academy stages and therefore the accumulation of experience. Regression analysis conveyed earlier EAP nomination was associated greater odds of a Premiership debut. However, when comparing J-EAP conversion rates by age, a more nuanced picture is painted. Later J-EAP nomination was associated with a greater proportion of players being retained into the senior academy, and overall had a greater conversion. However, when considering only players who were retained into the senior academy, players nominated earlier had a greater conversion rate. As such, whilst early nomination may be 'riskier', those who do progress into senior cohorts may be more likely to achieve a Premiership appearance. This reflects the low accuracy of early talent identification. These results challenge existing notions that rugby union is always a late selection sport (colloquially referred to as late maturation - e.g., Rugby Football Union, 2013), and suggests the talent system model supports both early and late athlete progression to the elite level.

#### ***3.4.4 Limitations and directions for future research***

Overall, findings reiterate the need to investigate efficiency and effectiveness from multiple standpoints. Whilst this study was able to highlight the differences between the academies and has speculated on factors which may influence such differences, explanations of these differences is beyond scope. Chapter 4 of this thesis will consider the influence of academy specific contextual factors (e.g., academy boundary, schools, Premiership club integration) to investigate variability between academies. Otherwise, it is possible that the resources available to an academy may influence their ability to support and develop players. Chapter 5 will take this into consideration. Finally, through considering conversion rates, this study has only considered the outcome of TD, without considering events occurring between academy enrolment and Premiership debut. These limitations will be addressed in Chapter 6.

### **3.5 Conclusion**

Absolute macro conversion rates were not representative of player subpopulations nor the individual TDEs. This strengthens the notion that research should take a more nuanced approach when utilising conversion rates and consider conversion from multiple standpoints. Substantial differences in efficiency and effectiveness were observed between the academies, suggesting that there is a need for further research to consider the contextual factors influencing player development within the macro talent system. Junior players who were perceived to hold high potential for future elite performance, and subsequently received greater relative resourcing, had increased odds of featuring in senior elite match day squads. This may have important implications for evaluating junior athlete performance and strategizing resource allocation. Finally, these results infer that rugby union cannot simply be labelled as a ‘late maturation’ sport, conveying that both players identified as high-potential early and late progressed to compete at the elite level. Overall,

the results of this chapter highlight the complexity of TD, the need to consider both the macro and meso levels of a talent system. This chapter has also raised questions of how the context of a TDE, and their resources, may shape talent development outcomes, but also how the processes of development may differ between players and TDEs. As such, Chapter 4 aims to address these contextual considerations.

## **Chapter 4: No solutions, only trade-offs - An exploration of contextual factors influencing rugby union talent development environments**

Shelley, A., MacNamara, Á., Behan, S., McCarthy, N., Jones, B., & Taylor, J. (2025). No solutions, only trade-offs: An exploration of contextual factors influencing rugby union talent development environments. *Journal of Sports Sciences*, 1-12. DOI: 10.1080/02640414.2025.2486884

Chapter 3 highlighted considerable variability in the conversion rates of EAPs across regional academies, indicating differences in efficiency and effectiveness within the talent system. As discussed, this variability may stem from factors such as initial identification processes, the resources required to support EAPs, and opportunities for senior progression. Otherwise, these results may reflect that standardised macro-system policy have different outcomes in different meso-level organisations. In this regard, the context of a TDE may play a critical role in shaping TD. It is therefore necessary to examine the factors driving this meso-level variability to inform and strengthen support from the macro-level.

### **4.1 Introduction**

Developing junior athletes towards senior performance defines the success and sustainability of sporting organisations (Martindale et al., 2005). As discussed in Chapter 2, the TDE is defined as ‘all aspects of the coaching situation’ influencing athlete development (Martindale et al., 2005, p. 354), and is considered to be one of the more controllable aspects of athlete development. As such, many professional team sports organisations have shaped environments to develop athletes, often using the organisational structure of an academy. Establishing and maintaining academies requires significant resourcing, as such it is important for organisations to understand their efficiency (the

relationship between organisation inputs and outputs) and effectiveness, reflected by the ability to achieve organisational goals (Bayle & Madella, 2002).

There are multiple factors impacting TDE operations, notably associated sporting organisations, rules and regulations, and the broader sporting context. In this sense, we might consider the TDE to be part of a wider complex system, with multiple levels of interaction and potential analysis (Taylor, MacNamara, et al., 2022). Chapter 2 described how policies implemented by the macro-level will impact individual athletes on the micro-level. A widely researched example is the setting of selection cut-off dates invoking relative age effects, affecting player selection and progression (Kelly, Till, et al., 2021; McCarthy et al., 2022). Otherwise, the meso-level individual academies are influenced by the policies of the macro-level (De Bosscher et al., 2008). In essence, the purpose of the macro policy should be to promote features of effective TD, though this has received less attention in the literature compared to the research focused on meso-level TDEs (Henriksen et al., 2010a, 2010b, 2011). As such, there was a need to consider interactions between the macro, meso, and micro levels of the talent system, and how these interactions may influence talent system and TDE effectiveness. Given the variability of efficiency and effectiveness within a talent system as demonstrated and discussed in Chapter 3, to best inform the policies of the macro talent system, it is also important to understand factors influencing the efficiency and effectiveness of multiple TDEs.

Effective TDEs are often characterised as those ‘producing’ elite athletes (Feddersen et al., 2021, p. 30) and aiming for holistic development (Gledhill et al., 2025; Hauser et al., 2022). As described in Chapter 2, it seems that effective TDEs across a range of contexts share common features, including long-term aims and methods, coherent messaging and individualised support (Henriksen et al., 2010a; Martindale et al., 2005). Ineffective environments are characterised by the opposite

features of a successful environment (Henriksen et al., 2014), notably a lack of integration amongst different aspects of the TDE, incoherent organisational culture, the lack of supportive training groups and role models, and a lack of understanding from the athlete's non-sport environment (Hauser et al., 2022). Importantly, Hauser et al., (2022) noted that effective and ineffective features may exist concurrently within the same environment. However, research into TDEs has primarily been conducted in contexts with a singular primary development environment. In the case of some sports, several organisations may be directly and significantly involved in a single athlete's development (e.g., club, school, age-grade international; Bjørndal et al., 2017; Taylor, Collins, et al., 2022). Research of interorganisational relationships have highlighted the importance of cooperation between multiple organisations in aiding TD (Babiak et al., 2018; Mathorne et al., 2021; Mathorne et al., 2020; Sotiriadou et al., 2017). Effective organisational relationships are characterised by collaboration in decision making and actions (Mathorne et al., 2021). However, historically this research has been limited to TD networks comprising limited numbers of organisations, with athletes only directly interacting with one of them. As such, there is a need to consider the impact of other sporting environments and organisations and how they impact an athlete's curriculum, representing the totality of their experience (Taylor & Collins, 2022).

#### ***4.1.1 English rugby union macro context***

To this end, as well as considering the interactions between the different levels of the talent system it is important to appreciate the context, defined as the background or set of circumstances that surrounds an event or behaviour (Proeller, 2013). As discussed in Chapter 1, at the macro-level, the NGB (the RFU) and PRL (the body representing the professional Premiership clubs) collaborate to develop players capable of competing at the senior elite domestic and international level, via a regional academy structure. At the time of this study 14 male regional academies were in operation. Ten were integrated with professional clubs competing in the Premiership (England's elite

domestic competition), the remaining four were standalone academies managed by the RFU owing to the demise of three Premiership clubs in the 2022/23 season. As discussed in Chapter 1, the male English rugby union talent system is organised in three phases: Developing Player Programme (DPP), junior academy, and senior academy. Specifically at the time of the study, this senior academy TDE only existed for academies integrated with Premiership clubs (n=10).

Throughout the talent system, player's developmental curriculum is enacted across multiple TDEs. In the junior academy, this is typically at local clubs, schools and, for some, international squads. In the senior academy, a player's curriculum will be enacted across professional club, lower league loan club, and in a minority of cases a university rugby TDE. Senior academy players may also be involved in international squads. Specifically, the role of schools in player development is of great interest in the English rugby union context, potentially being a significant TDE influencing TD. Broadly, player's educational establishments can be divided between 'state' or 'private' schools. State schools are government funded and free to access, with the RFU supporting a 'Academy, Colleges and Education' (ACE) league, whereby select state further education colleges are associated with regional academies. Alternatively, private schools (otherwise known as 'independent schools') charge admission fees. Whilst state and private schools both compete in the 'Daily Mail Trophy', the top U18 school rugby union competition, in the 2023/24 season 45 of the top 50 finishing positions were independent schools (*Daily Mail Trophy for Boys-U18A in Rugby Union for 2023/24*, n.d.). It has also previously been reported that 37% of the England, Scotland and Wales international men's rugby union squads were privately educated (Sutton Trust, 2019).

Academy boundaries are a relatively unique TD policy of English rugby union, with the macro-level organisations designating each academy a geographical perimeter (see Figure 1.1). Players are allocated to a region based upon either their home, school, or junior club address (providing

inclusion at club is from 13 years of age). Each academy is restricted to selecting players within their boundary to prevent competition between academies for players (Till et al., 2020).

Chapter 3 demonstrated substantial variation in the efficiency and effectiveness between the fourteen English rugby union regional academies. Whilst operating under standardised macro regulations, meso-level variability points to significant contextual difference between TDEs. As such, English rugby union provides a case study to consider how levels of the talent system interact to influence practice within individual TDEs. Specifically, this study aimed to explore how contextual factors impact the efficiency and effectiveness of male academy TDEs in English rugby union.

## **4.2 Methodology**

### ***4.2.1 Study Design***

As part of the IKT process, this chapter was underpinned by a collaboration with ‘knowledge users’ in all parts of the research process (Smith et al., 2023). Through this approach, I sought to engage with individuals within the context of English rugby union who have valuable insights, and influence to use and implement research findings (Smith et al., 2023). Towards this end, there was a need to understand the experiences of stakeholders within the English game.

Aligned to the pragmatic orientation and IKT process, I chose to understand the perceptions of as wide of a group of English rugby union academy stakeholders as possible. As such, focus group methodology was deemed to be most appropriate to understand the decisions being taken in practice. Focus groups may also offer different perspectives and greater insight than individual or group interviews (Nyumba et al., 2018). With the researcher moderating group discussions between participants rather than acting as an investigator (Nyumba et al., 2018), focus group format allows

the discussions to be participant lead within parameters set by the researcher (Bachtiar et al., 2024). In this sense, this data collection format enabled academy stakeholders to identify and discuss key issues pertaining to their academy context whilst I acted to guide the discussion against the research aims.

#### **4.2.2 Participants**

Prior to focus groups, academy managers were informed of the study and invited to participate through a gatekeeper at PRL. Academy managers were asked to review participant criteria and nominate an additional three to seven staff members to participate. Criteria required participants to be involved with academy operations and/or influence on TDE decision making. Following nomination, all prospective participants were emailed with participant information and informed consent. A total of 92 staff members across all 14 academies consented to participate, their roles including academy manager, administrator, rugby coach, strength and conditioning coach, psychologist, physiotherapist, and performance analyst. Focus groups ranged between 3 to 14 participants (mean =  $7 \pm 1.96$  per academy), with participants having an average 7.84 ( $\pm 2.41$ ) years' experience in English rugby union TDEs. Participants were anonymised based on their organisation (A-N) and the order of contribution to the focus group (i.e. first to speak at Club A would be A1). Thirteen focus groups were conducted in-person, and one was conducted using video conferencing software (Zoom Video Communications, San Jose, California, USA). All focus groups were conducted between November 2023 and January 2024.

#### **4.2.3 Procedure**

Focus group questions were developed against the aims of the study and towards the purpose of understanding effective practice in academies, along with the barriers to effective and efficient practice. I discussed the questions with critical friends (i.e., supervisors, PRL stakeholders, and

rugby union development coaches) to ensure they were clear, relevant and aligned to the research question. No significant amendments were made following this step. Each focus group began with a stimulus presentation informed by data analyses presented in Chapters 3 and 5, outlining the academy's conversion rate of players and relative contribution to the Premiership (see Chapter 3), the academy's ratio of expenditure and Premiership players developed and male population data within the academy boundary (see Chapter 5), as well as the number and type of educational institutions associated with the academy derived from academy PDG and EAP registration lists. The focus group conversation was guided by the stimulus presentation and discussion was prompted with a series of standardised open-ended questions, such as "how do you determine your academy is effective?", "what do you consider the most important stage or stages of the academy to be?", and "if there were no rules or regulations, what might you do differently?", that facilitated a rich discussion (Arksey & Knight, 1999). Each focus group lasted between 75 and 106 minutes ( $\bar{x} = 92.64 \pm 8.79$ ) and were audio recorded for transcription and analysis.

#### **4.2.4 Data analysis**

Reflexive thematic analysis (RTA; Braun & Clarke, 2019) was used to analyse transcriptions. RTA "is about the researchers reflective and thoughtful engagement with their data and their reflective and thoughtful engagement with the analytic process" (Braun & Clarke, 2019, p. 594). Reflecting Braun and Clarke's proposition that coding and analysis can flexibly adopt both deductive and inductive approaches (Braun & Clarke, 2020), a deductive-inductive approach was adopted, whereby codes were generated inductively into a deductive frame based upon the research question, thereby offering a lens to interpret the data in a top-down approach (Braun & Clarke, 2022; Byrne, 2021). To facilitate deep immersion in the data, I read and re-read transcripts several times whilst taking familiarisation notes. In the second phase, following multiple sweeps of analysis, semantic and latent codes were initially generated (e.g., 'Consistent intra-organisation messaging', 'Staff

spanning between academy phases’). The third phase of analysis involved initial themes being generated from the codes based upon shared concepts. For example, the aforementioned codes related to organisational vertical coherence. Aiming to generate richer interpretations of meaning, critical friends challenged the interpretation of the data (Braun & Clarke, 2019; Byrne, 2021). Qualitative analysis software (QSR NVIVO-12) was used to assist in the organisation of data into thematic hierarchies.

The fourth phase involved initial themes being reviewed and refined, facilitated by discussions with critical friends to consider whether all themes functioned as meaningful interpretations of the data and challenged whether they provided information that addressed the research questions. For example, upon reflection and refinement, and reflecting the non-linear process of RTA, candidate theme ‘Extent of integration between environments’ was developed into two distinct themes. Reflecting this development, code generation and refinement was revisited (Braun & Clarke, 2019). The fifth step involved naming and defining the themes, ensuring that the theme provided a coherent and internally consistent account of the data, as well as choosing representative exemplar data extracts. During this stage it was important to consider the deep analysis of the underlying data of the themes, as such sub-theme names were changed for clarity; for example, subtheme ‘Outsourcing’ became ‘Concurrent outsourcing’ to better reflect the concept of the subtheme. Reflecting the reflective nature of RTA, the sixth and final phase of the data analysis process involved the writing of the report which was recursive and woven into the entire process of the analysis (Braun & Clarke, 2019). During this phase, themes were reordered to ensure findings were reported in a logical and coherent order.

#### **4.2.5 Reflexivity**

To enhance trustworthiness, several steps were taken. Critical friendship was a consistent feature of the research design. Independent rugby union coaches were used to review the focus group questions and prompts as well as the stimulus presentation. The critical friendship was augmented by the participant member reflections and presentation of themes to three rugby union stakeholder audiences. Academy managers were contacted following the fifth phase of analysis to engage in member reflections based on preliminary theme generation; 10 of 13 academy managers engaged in member reflection discussions, all conducted on Zoom, lasting an average of  $31.4 \pm 15.21$  minutes. All member reflection data was recorded, transcribed verbatim and data subsequently integrated into the analysis prior to write up (Everard et al., 2023). Member reflections were used to explore and expand upon the findings with academy managers. This process led to further crystallisation of themes and subthemes, and highlighted academy specific nuances. Although all academy managers felt that the themes reflected the overall challenges of the talent system, each participant noted specific ways that these challenges manifested in their own contexts, as well as the context-driven workarounds they had found. For example, one academy nominated EAPs to have more control over their school programme.

Given the multiple data collections points, and the length of the data collection, it was important that I maintained a reflexive journal to have an embedded and ongoing process of reflection throughout data collection (Braun & Clarke, 2021). As an example, I utilised the reflexive journal to reflect on the stakeholder presentations, and specifically the conversations generated by the information presented, the wording of questions, and my role as a moderator. I used the reflexive journal to consider how my increasing knowledge of the talent system and the workings of the academies, gained through the earlier focus groups, shaped the way I approached subsequent focus group discussions. As the focus groups progressed and my understanding of the variability across

academy contexts increased, I became more confident in guiding discussions as they naturally deviated from the core questions and was able to compare participant responses with those from previous focus groups whilst the discussions were unfolding. This earlier focus group experience enabled me to prompt and probe in ways that encouraged participants to compare their academy's contextual challenges in greater depth. Although the structure of the focus groups and the guiding questions remained consistent, this growing contextual understanding influenced the way I interacted with participants, enabling me to facilitate conversations with greater situational awareness and responsiveness.

### **4.3 Results and discussion**

The aim of this study was to explore how contextual factors impact the efficiency and effectiveness of male TDEs in English rugby union. Four themes and 14 subthemes were generated using RTA (see Table 4.1). Each of these four themes 'Multiple loosely connected concurrent environments', 'System regulations and structure drives practice', 'Organisational Influences', and 'Searching for bang for buck' are presented below to provide a cogent narrative of the data.

Table 4.1 Results organised into themes and subthemes and exemplar quotes

Theme	Sub-theme	Exemplar quotes
Multiple loosely connected concurrent environments	Rugby coupled to player's education	The main bits are working at U16's, not just from a curriculum point of view, but guiding them to the right places is crucial. If they're not guided to the right schools, they're not going to get through. (C4)
	Lots of rugby, just not with the academy	There's poor links with National League, Championship clubs... We're losing a lot of the contact time we have with them here, so there's some guys that we'll see on Monday and we won't see them all week. (C2)
	Differing agendas in different settings	Realistically for them, their goal is not player's long-term development... they have to win games. It's not necessarily the person's problem. The situation creates it. (I3)
System regulations and structure drives practice	Lack of agency and autonomy	At the end of season of under 16, I'm expected to produce squad of say, 60 players for the RFU festival for two groups, out of academy patch that is, well, 10 times as small as another... you're asked to produce the same absolute output numbers. It's massively challenging. (D3)
	Salary cap regulations promote development	I'd say from a financial standpoint, [effectiveness] is how much can we save the senior cap by populating it with guys who are in the academy, to be able to still hang on to our big-name players. (K3)
	Limited time to bridge the gap from academy entry to exit	It feels very fast. So, like from the moment I start to identify them at 15-16 to their first major transition in rugby is end of 18... It's like 2 and, 2 years four months really of playing. By having that as a constraint, it shapes how we act and behave. It shapes the conversation, shapes decisions, and at times feels like it's a race... it's still a race to find them and a race to develop them. (C5)
	Competition directs attention	We all talk about being development driven, and competition supports that. (D2)
	Regulated to keep things local	If resources were the same, [academy boundary] was the last thing we [would] want to change... It would make us vulnerable to the bigger richer clubs. (H6)
Organisational influences	Academy-Club integration and opportunities	The backlog of players that might be in the way of young lads coming through, that wouldn't happen at other clubs. They're things that are out of our control until you really can try and influence up and help with the direction and strategic planning of the club. (J3)
	Reliance on perception of senior head coach	So, like when you had [Ex DoR], for example... he wasn't playing young players from the academy... who you have above I think dictates a huge amount. (I3)

Saturation and opportunity

There isn't really an opportunity if someone's just become an established player and they're at the prime in their career and they're fit. They're not necessarily replaced by someone coming through as an 18–19-year-old unless there's a continual turnover of senior players... Players are always coming through the bottom where we believe are good enough. But quite often there might not be the opportunity in that window where they're at their best chance of making a debut or becoming a professional... it doesn't mean they didn't have the potential to be an outstanding player, there wasn't the opportunity at that time. (H8)

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Searching for bang for buck

Prioritisation of resource

So, the club would seem to prioritise the 18s. I suppose that's what gets the most attention here. That is the kind of top of the pathway and that's where most of our resources are spent. (G6)

Concurrent outsourcing

So, if you take private schools, they've got S&C, medical all on the site... rather than have to resource that as much, we can grow our relationship... lean on that. (G8)

Placing bets

The heavy resource goes when they get older doesn't it... we resource them better at 18, we resource them better as EAPs... we know that they're statistically less likely to be a punt... there's so many of them and they haven't quite developed yet. You're not sure where to put resources, so we don't tend to put as much in. (I3)

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### ***4.3.1 Multiple loosely connected concurrent environments***

‘Multiple, loosely connected, concurrent environments’ represents the nature of player development in English rugby union, where players experience multiple environments concurrently (e.g., school, academy, international, and loan club). These environments were loosely connected, with little academy TDE influence.

#### ***4.3.1.1 Rugby coupled to players’ education***

Player progression was perceived to be significantly influenced by a player’s education, with those players not attending an appropriate establishment perceived to be considerably disadvantaged: “...those who go to a high-quality rugby environment at an independent school, they just completely overtake and kick on. But the lads that stay at state school from 16 to 18, the disparity is enormous” (F4). Reflecting this, academies facilitated players to change schools at age 16: “we’ve certainly tried to guide and direct boys that maybe aren’t at great rugby playing schools... to some of the better circuits for example, or ACE [club affiliated] programmes” (J3). Resulting fee remission and school scholarship opportunities created tension for both the academy and player: “we like to get our players into scholarship... But then the schools very much see them as a commodity” (E8). Whilst it was deemed important that players attended schools with appropriate rugby programmes, the use of scholarships were perceived to be a barrier to integration across these concurrent environments.

The significance of school and education environments on player development is in contrast with literature from other sports where clubs or academies are not dependent on other external environments for athlete development (e.g., Larsen et al., 2013). Whilst comparative data between school and academy rugby experiences have yet to be considered, academy led competitions are proposed better emulate the physical challenges of senior competition compared to school (Read

et al., 2018), with academy training offering better physical preparation for these competitive demands compared to schools (Phibbs, Jones, Read, et al., 2018).

#### *4.3.1.2 Lots of rugby, just not with the academy*

Participants perceived significant challenges when managing player's training load between TDEs. Schools and colleges were the primary source of a player's competition prior to senior rugby. However, it was perceived that some schools' match volume was inappropriate, compromising player development: "it's the quantity... most of our adaptation comes from offloading kids because they do too much" (I3). Participants also perceived an inability for the academy to influence school rugby when disagreements arose:

The message does get banded a lot to academy managers: 'use your EAP status', 'bring RFU to the party', 'bring Prem rugby [PRL] to the party'... it doesn't matter who you bring to the party, schools will do what they want to do. (L6)

As such, to accommodate the number of school matches their players participated in, academies had to adjust their programmes and contact time with players to the reported detriment of individual development: "...it gets more frustrating for us as we're going: 'well don't come to our training then, go focus on your school'...Where's that Premiership player going to come from?" (E7).

As players progressed to professional level, clubs did not have enough players to hold inter-academy fixtures. As such, lower-league loan clubs were relied upon to provide match experience for senior academy players, much as is the case across other team sports (Prendergast & Gibson, 2022). However, the uneven geographical distribution and relative locations of Premiership and lower league clubs posed significant challenges for academies. In instances where university rugby

was utilised instead, access was again reliant upon a player's educational choices and proximity of a quality university rugby programme: "there isn't really a BUCS [rugby playing] university in around [city]. That's probably one of our challenges. I'd love to have had that over the years" (J3). As such, while the development of senior academy players relied on concurrent environments, this was unequally distributed and differed significantly between regions.

#### *4.3.1.3 Differing agendas in different settings*

Academy staff perceived there to be differing agendas between the player's concurrent environments. They noted that the desire to win in school competitions hindered player development: "they're [independent schools] focused on their fixtures and winning their fixtures. Therefore, you'd argue that the long-term development of those players is negated by that" (B2). This perception is supported by data suggesting a positive relationship between match frequency and training load in schools, indicating a focus on match preparation over long-term development (Phibbs, Jones, Roe, et al., 2018b).

In the senior academy, participants noted the importance of loan clubs as part of the player's trajectory. However, there appeared to be a lack of incentive for these clubs to promote long-term development, instead primarily concerned with winning fixtures. Interestingly, this focus on winning was seen as more developmentally appropriate for senior academy players compared to their younger peers: "[player's] got to go into the Championship, or National One [lower leagues]... you need to execute X, Y and Z, and that's beginning to look a little bit more like what's expected of you in the senior group" (K3). In the senior academy, exposure to appropriate competition was considered essential for development and participants noted that this was more likely to be accessed through lower league clubs than in university rugby: "[universities] talk about performance, but they don't know what performance is" (C4). This reflects a common heuristic that

close games were optimal for player development: “every academy fixture... we would want to be competitive... I don't think we would define success on whether we were winning... we always tried to have a longer-term view” (J3). In this regard, there is surprisingly little research that has considered the impact of competition on athlete development especially towards the transition to senior status (Hauser et al., 2022).

### ***4.3.2 System regulations and structure drives practice***

The second theme, ‘system regulations and structure drives practice’, reflects the impact of macro-level talent system design and how governing body (RFU and PRL) regulation acted as constraints on TDEs and individual player development.

#### ***4.3.2.1 Lack of agency and autonomy***

There was a strongly held perspective that standardised system rules and regulations constrained academy operations: “hamstrung by rules that sit in place... And maybe to be more efficient, you’d have a bit more autonomy on how you do things” (F5). Participants perceived regulations, rather than enhancing standards, limited their ability to meet players’ needs: “elite coaches are paid to do the job [and] aren't allowed to make that decision” (A5). In another example, based on the “as many as possible, for as long as possible” principle (Erikstad et al., 2021), academies were required to engage more players than some participants believed necessary or practical: “you're forced to keep loads of kids and larger squad sizes at the stage where you don't need to” (I3). This approach also impacted the quality of provision and the ability to select or deselect players at earlier ages:

There is the sort of philosophy... from the RFU that you shouldn't release the player... once they're in Under 14 they're through until the Under 16s... We're trying our best to do it,

but... resources, and also facilities, are limited. How many players can you fit on a pitch?

How much session time have you got? (J6)

These rules and regulations appeared to be designed to discourage inappropriately early deselection. Whilst participants understood the intention, when put alongside contact time and other constraints, there seemed to be significant implications for player development: “we are engaging with huge numbers... it it's more of a stakeholder engagement piece than player development or talent ID” (F3). Participants suggested that inflexibility of rules and regulations, and a lack of appreciation of contextual factors, negatively impacted the academies’ efficiency and effectiveness, and potentially the quality of player’s developmental experiences.

#### *4.3.2.2 Salary cap regulations promote development*

In contrast, salary cap regulation seemed to positively influence academy effectiveness. Even in clubs with the highest budgets, salary cap regulation was perceived to place greater emphasis on developing players through incentives involving ‘cap credits’ allowing for increased player salary expenditure. This incentivised clubs to support TDE practice: “by 2026, we want 12 homegrown players... starting in the matchday 23... If we get 12, then we get... 600 grand worth of cap space” (G5). However, pointing to the unintended consequences of regulations, the salary cap regulation was perceived by non-Premiership academy staff to constrain player progression. This led one academy to purposefully prioritise relatively younger players with greater opportunity to transfer to a Premiership club before their 18th birthday and be included by the ‘cap credit’ regulation: “...we'd have been focusing heavier on Q4’s and Q3’s... We didn't feel we could have a... Q1 birthday and get them signed effectively in that window because clubs weren’t signing players [until] later on in the season” (E2). This provides an example of how macro policies are

consequential for individual micro-level practice within a TDE. As such, macro regulation can only be part of any approach to enhancing practice in TDEs.

#### *4.3.2.3 Limited time to bridge the gap from academy entry to exit*

English rugby union has systemically mandated late selection policies, with academy selection typically beginning at U16. There was widespread approval of delayed selection: “does rugby need to start at 12? No. Does rugby need to start at 16? Yes... We’re a late developer sport” (N8). Whilst delayed selection mitigates against some of the challenges associated with early identification (Bailey & Collins, 2013; Till & Baker, 2020), the limited time within a TDE poses a challenge for academy and player to bridge the gap between junior and senior performance:

You look at any other sport, any other academy - swimming, football, athletics, even drama, dance, music... they would have far more contact time with their athletes and performers than do. We're once a week, sometimes twice a week (J3).

In addition, based on UK law, senior academy players must be paid, thus increasing the resourcing needs of clubs, limiting the number contracts offered, and increasing the jeopardy of non-selection. Whilst national legislation is beyond the scope of the talent system governance, in this instance, it is important to acknowledge how it acts as a constraint on TDE practice.

#### *4.3.2.4 Competition directs attention*

Participants perceived macro-organisation facilitated competitions, such as academy leagues and tournaments, were vital in developing athletes towards elite performance. The prioritisation of resources between age-grades was reported to reflect the competition calendar: “the U18s have more games than any of the others, so they naturally get more attention because we have to spend

more time with them purely because of the amount of fixtures” (A2). Some academies, and individual members of staff, considered U18 league performance to be indicative of academy effectiveness: “use that [U18 fixtures] as a benchmark to see how effective we are at producing those players of that quality” (J4). The U18 league was also deemed important for individual player development: “it's going to pretty much determine who gets contracts, where they get contracts, if they are going to be offered a university scholarship” (I5). The greater resourcing at U18 was partially achieved through increasing contact time with players: “we want them to access us twice a week to be ready for [the] academy league” (E8). As such, competition influenced distribution of resources and encouraged investment. The lack of post-U18 competition meant fewer players were offered senior contracts: “the lack of second team opportunities that PRL were unable to provide us... we didn't need that surplus of squad players” (A3). As such, macro-organisation facilitated competition influenced meso-level selection policies and limited player development opportunities.

#### *4.3.2.5 Regulated to keep things local*

Participants perceived that their academy effectiveness was limited by their geographical boundary, specifically the talent pool within their area and the number of rugby-playing schools:

“if you haven't got [that] level of player, or that, the wider environment that's going to produce them - that is independent schools to be quite frank - then what do you do? I think we're effective based on the resources at [our] disposal” (M2).

There was also an acknowledgement that without boundary regulations they would search for players nationally, illustrating how the intention of this regulation actively encourages local investment and prevents competition for young players (Till et al., 2020). Academies speculated that without the boundaries it would be a “race to the bottom” (G3) to scout the best players.

Academies noted that national scouting would have resource ramifications: “you’d probably spend the majority of your time having conversations with those players, parents, whoever, to keep them on side as opposed to actually looking at their development” (L6). As such, the constraints of an academy’s boundary influenced player selection, but created resourcing implications: “every academy is so paranoid of missing someone and you cast the net wide and go ‘well, we’ll just scoop them all up’” (F4). As such, boundary regulations were not only perceived to be adaptive for recruitment, but also supportive of TDE practice.

### ***4.3.3 Organisational Influences***

This theme, ‘Organisational Influences’ considers the organisational factors contributing to, and constraining, academy effectiveness via the progression of players through the different stages in the academy-club’s system.

#### *4.3.3.1 Academy-club integration*

Vertical integration, the connection of working practices across organisational levels (Taylor & Collins, 2022), was perceived to impact academies' effectiveness in developing elite players. Shared goals throughout a club’s organisational structure seemed to encourage integration: “there's been a far greater emphasis from the board [of directors] ... of having 50% or more of the senior squad homegrown... that's also got to be linked with having a successful first team” (F3). Shared goals also seemed to influence organisational behaviour, facilitating collaboration between the academy and the senior squad staff and positively impacting player development. Without these shared goals, non-Premiership academies struggled to make sense of the outcomes of their practice: “if you can tell me what they [the RFU] want then you'd be a better person than me” (J2).

Vertical integration between academy and senior club appeared to be a function of the club's strategic direction and senior squad resourcing. Where financial restrictions prevented clubs importing established senior players, academies were perceived to be more prominent in the club's organisational structure: "in the position that we're in now, we would be relying on more younger players... Whereas back then we had a large mature squad, so there wouldn't have been many opportunities" (H4). Otherwise, it was speculated that clubs with greater financial resources and budget within the salary cap may rely less on their academy: "we don't have to rely on [the academy] because we have the financial backing within the salary cap to not" (M3). Whilst TD is essential for sustainability (Martindale et al., 2007), the business of professional sport may motivate a cost-benefit consideration of TDE investment against buying established senior players.

#### *4.3.3.2 Reliance on senior head coach*

There was a perception that academy player progression depended on the perceptions and developmental approaches of those appointed to strategic leadership roles within the club: "if the head coach said: 'I don't want local players, I want to buy all these players from the rest of the world'... you can put in all the investment you want, but ultimately they've been blocked" (N10). Misaligned expectations of newly contracted senior academy players were also perceived to hinder progression: "senior coaches, first day of preseason, they've judged half of the academy lads ... it takes them a long time to get rid of that first impression" (H4). Amongst some focus groups, there was a perception that senior coaches were impatient for players to progress, leading to inappropriate judgements of their future capacity (Taylor & Collins, 2021).

The senior squad's performance was perceived to influence senior coaches' willingness to select younger players: "if you've got an incredibly successful European winning trophy team, Premiership winning trophy team, that team is harder to get into... than someone that's sitting 10th,

11th every year” (B2). However, there was also a strong perception that long-term club success required senior coaches to facilitate opportunities for young players. In this regard, it was notable that participants did not reflect on strategies to accumulate senior elite playing experience. Whilst the literature on junior to senior transitions largely focuses on the coping skills of athletes (e.g., Stambulova et al., 2007), there seems to be little insight into *how* TDEs introduce players to first-team squads.

#### 4.3.3.3 *Saturation and opportunity*

In addition to the challenges of making the junior to senior transition, participants suggested player progression was also potentially impeded by competition for specific positions and the resourcing needs of multiple players: “there was a cohort of young academy kids that came through that stuck together, that did make it harder to break in” (K3). When multiple players progressed at a similar time, this had resourcing implications in terms of coaching staff from offering enough resource, coaching time, and attention to individuals. This was exacerbated by differing positional demands, with some positions described as requiring more time to prepare for the demands of the senior game and therefore more coaching resource: “position wise, like props... they’re not getting those opportunities in the first team for a lot longer... a back three player... is going to have much more opportunity.” (G3). The opportunity for progression was made significantly harder by the well evidenced gap in performance between junior and senior (Argus et al., 2012; Cunningham et al., 2016). Transitioning academy players were now competing with established elite senior players for their place in the team: “you had to be an international to play in that backline and if you weren't, you weren't [selected]” (L5). As such, their relative inexperience compared to other players made it difficult to gain experience. This ‘chicken and egg’ type situation meant that players needed playing opportunities to enhance their performance but couldn't get opportunities without enhancing their performance.

#### ***4.3.4 Searching for bang for buck***

Academies had finite resources (i.e. time, attention and finance) and employed various strategies to efficiently use resources while maximizing effectiveness. Notably, participants perceived TDE practice would always be resource constrained, as such ‘best practice’ may not necessarily be achievable.

##### ***4.3.4.1 Prioritisation***

Participants reflected that whilst every stage of the academy was important for player development, limited resources required prioritisation: “you can't do everything, and you can't do everything all at once. So, it's like what's the most important thing at that time for their age and the stage of their journey” (C5). U18 players were relatively more resourced than other age-grades to prepare them to transition from the junior academy and for the competitive demand of the U18 academy league. Conceptions of rugby union as a late selection sport also seemed to influence resourcing: “we see this sport as a late developing sport, so you wouldn't put loads of resource at the bottom if that's the case” (C4). However, participants reflected that the relative lack of earlier investment led to later issues: “you get to under 18 and [it's] almost like we're curing or preventing a lot of problems” (D3).

At the micro-level, to mitigate against the resourcing challenges of the context, individual players perceived to be high-potential (EAPs) were prioritised: “we get more opportunity to develop the relationship. Rather than giving them [EAPs] more, we just have more opportunities for them” (K5). Staff reflected knowing which players to prioritise helped manage their limited attention resource: “at some point you have to prioritise... to an extent it's easier to have EAPs so you know who to prioritise” (F9). However, participants reflected the need to develop full squads of players

to support and challenge the development of high-potential players (Baker, 2022): “it would be hard to find that next professional player and develop them without the rest of the guys there... you do need those supporting players and not just identify the one guy that's going to make it” (H4). Yet, the macro-level policy solution of prioritisation of EAPs seemed to reflect a misplaced confidence that it would be possible to identify those players who would make future progress (Chapter 3).

#### *4.3.4.2 Concurrent outsourcing*

Despite the perceived impact on the quality of player experience, participants deemed outsourcing elements of player development to concurrent environments (e.g., schools and loan clubs) had resource benefits. There was a perception that this outsourcing was essential to the functioning of the overall system: “we need the schools, the colleges, the loan clubs... We haven't got the resources to play lots of games, to do all the coaching, to do everything” (B1). Participants also noted how this outsourcing was contingent on the quality of the provision and the extent to which the academy could trust the provision and the alignment between concurrent environments. This was most commonly perceived to be the case in strength and conditioning and physiotherapy support: “the S&C coach [at school] will personally develop these athletes in alignment with what we're asking... That actually then allows me to give other players resource” (C6). However, the benefits of outsourcing were not reflected by perceptions of coaching at any stage of the system. Academies relied on networks of volunteer coaches to facilitate the pre-academy programme (DPP). Often, it was perceived that these coaches had “no idea of the bigger picture” (H6) despite the important role they played in establishing the “foundation of the academy” (J3). There was also a perception of limited alignment or integration between academy and school rugby coaches: “we actually are trusting, for wanting a better word, the school to be aligned loosely enough with what

we're trying to get from the player point of view to actually deliver that development” (H6). Whilst outsourcing was necessary given systemic constraints, it was seen to limit TDE practice.

#### *4.3.4.3 Placing bets*

There was a sense that academies delayed providing individualised development until a player’s progression post-U18 was more likely. This was evident in the EAP nominations, and provision of more individualised resourcing. Many academies delayed EAP selection until the U18 season: “If we’re going to EAP someone early, so before the under-18 year... they need to be someone who is outstanding” (H6). Many participants reflected on the importance of certain positional requirements, describing the placing of bets based upon anthropometric characteristics: “you can’t coach someone to be 6 foot 5” (N9). Given the weak link between junior and senior performance (Güllich et al., 2023), delaying investment may allow coaches and practitioners to be more targeted and invest limited resources in players more likely to progress. However, as discussed in Chapter 3, decisions on when to invest in individual players would seem critical to development and progression.

## **4.4 General discussion and applied implications**

The aim of this research was to explore how contextual factors impact the efficiency and effectiveness of male TDEs in English rugby union. Academies considered effectiveness through the lens of players progressing to the elite level, their ultimate performance level, and the holistic development of players. In terms of efficiency, as reflected in system and academy conversion rates<sup>2</sup>, the results suggest that macro and meso efficiency is inherently limited by the combination

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<sup>2</sup> Reported in Chapter 3

of regulations mandating large junior cohorts and the bottleneck imposed by senior academy selection. In the case of English rugby union, it appeared that TDE practice at every level was shaped by the context of the system, very often acting to limit the effectiveness of TDEs.

As discussed in Chapter 2, macro-level organisations shape the context and practice of TDEs at the meso-level through regulation. As such, to address contextual challenges whilst being centrally governed, it is the challenge of the macro organisations to develop and implement system-wide rules and regulations that promote good practice whilst allowing TDEs the autonomy to adapt to their specific context (Gagnås & Thue Bjørndal, 2025; Sotiriadou et al., 2017). In this case, rather than raising standards, participants perceived regulations to be overly constraining and often leading to maladaptive consequences for player development. Thus, in their current format, the regulatory constraints of English rugby union do not allow for consistently effective practice in TDEs.

From a theoretical perspective, TDE research has focused on contexts where there is a singular coaching environment (Henriksen et al., 2010a, 2014, 2014; Larsen et al., 2013). Whilst offering an appropriate lens, it does not reflect the context of TDE practice in English rugby union and therefore there is a need for greater focus on the social circumstances of talent system research (e.g., Gavin et al., 2024; Vaughan et al., 2022). Where it is the case that athletes train across multiple concurrent environments, there is a need to understand how TDEs act to shape coherence of an athlete's curriculum (Taylor & Collins, 2022). In addition, whilst the integration and collaboration between multiple organisations (Mathorne et al., 2021; Mathorne et al., 2020) and stakeholders (Pankhurst et al., 2013; Taylor, Collins, et al., 2022) has been considered, there is growing recognition of its centrality to TDE practice. Whilst it has been suggested that shared understanding would be considered good practice between collaborating organisations (Mathorne

et al., 2021), there remains little research to guide how a TDE might develop this shared understanding. Mathorne et al., (2020) highlighted the collaboration between organisations aiming to promote athlete development was enhanced by the organisations coming to a shared formal operating agreement. In the present context, this would require academies to have an active role in the formation of multiple formal agreements with numerous schools, clubs and colleges, something practically unfeasible based on current regulation.

Whilst much of the research into TDEs has considered what features characterise effective or ineffective environments (e.g., Hauser et al., 2022), relatively little research has considered how these features may be influenced by resources. Henriksen et al., (2010a) noted that an inadequacy in resources leads to compensation in operations. Yet, it would seem to be the case that resources, be they time, attention, or finance, will always be limited. In this study, resource constraints shaped TDE practice and the norms of the macro system, with the academies adapting practices to achieve institutional goals whilst striving to make efficient use of limited resources. Whilst all academies compensated, it is likely they compensate to different extents in different areas based on specific contextual challenges. In this sense, there is greater need for the context of the TDE to be seen through different systemic lenses when considering recommendations for TDE practice (Sweeney, MacNamara, et al., 2023).

#### **4.5 Limitations**

The results presented in Chapter 4 are only from the perspectives of the regional academies; the perceptions of other stakeholders in the concurrent environments and of the macro system organisations (RFU and PRL) were not considered. Future research can support practice by generating greater understanding the influence of other TDEs and how the network of environments

impact player development and may seek to consider the perceptions of the additional player stakeholders.

#### **4.6 Conclusions**

The efficiency and effectiveness of the English rugby union academies were influenced by several overarching contextual factors, including the significant reliance on TDEs external to the policies of the talent system, macro-system rules and regulations, and integration with Premiership organisations. The resource allocation strategies of TDEs have received little research attention. This study has highlighted several strategies adopted by academies to alter their practices in response to the challenges posed by limited resources. As such, to build on this finding and advance the thesis aim of informing resource allocation, the next chapter quantitatively examines the relationship between academy resources and talent development outcomes.

The findings of this chapter reveal a complex, multifaceted interplay between the macro, meso, and micro levels of the talent system. The interaction of standardised system regulations with TDE specific context at times led to unintended and maladaptive consequences for player development. This further supports Chapter 3 of the non-homogeneity of the talent system. Whilst research often focuses on identifying ‘best practice’ to optimise TD, as this chapter demonstrates, what is practically deliverable is inherently constrained. Taking into account the macro-level lens applied, TD may therefore be viewed as a complex challenge which has no stable solutions, but rather more or less optimal trade-offs (Sowell, 2007). Results suggest that the constraints of the English rugby union talent system, whilst offering several good practice recommendations, prevented consistently effective practice in academy TDEs. It is suggested that the design and guiding policies of the English rugby union talent system should be reviewed with the inherent tensions related to efficiency and effectiveness considered.

## **Chapter 5: Bang for buck - Exploring associations between talent development environment resources and effectiveness in male rugby union**

Chapter 3 demonstrated considerable variability in the efficiency and effectiveness between the fourteen regional academies. Chapter 4 aimed to explore these findings with 14 the regional academies, finding that the academies perceived resources to constrain practice. There were strong perceptions that features of the academy boundary limited the academies' effectiveness as deemed by the development of Premiership players. Specifically, the talent pool and the number of high-quality rugby playing schools within the academy boundary was perceived by some academies to limit their effectiveness. As such, the study presented in this chapter aims to quantitatively consider the potential influence of these factors on player development outcomes.

### **5.1 Introduction**

As discussed in Chapter 2, talent systems are networks of organisations designed to support the progression of athletes towards senior elite performance (Taylor, MacNamara, et al., 2022). These systems are typically comprised of macro-level organisations (e.g., national governing bodies or leagues) and meso-level organisations (e.g., professional clubs, TDEs). TDEs refer to the social and organisational contexts which influence and facilitate TD, and are proposed to be one of the more controllable factors influencing athlete development (Martindale et al., 2007). This has led to considerable interest in understanding and evaluating the effectiveness of TDEs, particularly in terms of the coaching, support and development opportunities afforded. In the context of TD, effectiveness is often operationalised as an organisation's capacity to develop senior elite athletes (Feddersen et al., 2021). As highlighted in Chapter 2, a substantial body of research has focused on the organisational and environment features which may contribute to, or hinder reaching these

outcomes (Henriksen et al., 2010a, 2011, 2014; Larsen et al., 2013, 2020). In this sense, this line of inquiry has sought to understand the mechanisms through which TDEs contribute to progression towards senior elite success. However, there is also a need to understand factors contributing to effective TDE processes and features (Collins et al., 2019), particularly in relation to the availability and deployment of resources that support practice.

Across talent systems, substantial resources are invested with the aim of improving the effectiveness of TDEs. As discussed in Chapter 2, resources, whether tangible (e.g., financial capital), intangible (e.g., time, culture), or human (e.g., attention, expertise), are critical assets leveraged to achieve organisational objectives (Grant, 1999). At the elite level, the relationship between resources and sporting outcomes has been well established, particularly in relation to the financial investment at the macro-level of talent systems (e.g., De Bosscher et al., 2009). National governing bodies (NGBs), for example, depend on adequate resourcing to implement and support effective talent systems (Robinson & Minikin, 2012), with financial investment consistently associated with elite international sporting success (De Bosscher et al., 2009). Of course, it is not the volume of absolute spending that may be the most important factor, but the strategic investment and deployment of resources that may confer a relative competitive advantage (Truyens et al., 2016). Regardless, macro-level policy decisions inevitably shape strategic decisions at the meso-level, exemplified by policies such as the promotion of 'homegrown players' in English soccer (Amenta et al., 2012). In addition, limited resourcing at the meso-level appears to be a limiting factor, often necessitating compensatory practices that may undermine the effectiveness of the TDE (Henriksen et al., 2010a; Chapter 4). Yet, there remains a relative lack of research that has inferentially considered the relationship between resources and TDE effectiveness.

Although resources play a vital role in the implementation of effective sport policies and performance, they are inherently limited (Taylor, MacNamara, et al., 2022). Consequently, it is important to understand whether resources are being invested efficiently. Efficiency can be understood as the relationship between inputs and outputs (Bayle & Madella, 2002). Achieving a balance between efficiency and effectiveness is likely to be a key determinant of the sustainability of a talent system or of an individual TDE. ‘Cost effectiveness’ analysis provides an evaluative tool in this regard, enabling the comparison of resource investment versus the achieved outcomes (Garber & Phelps, 1997; Robinson, 1993). In the context of TDEs, this analysis may involve a comparison of financial investment versus the number of elite athletes developed, the number of elite performances achieved, or the level of ‘eliteness’ achieved. Given the inherent variability across talent systems and the observed variability between TDEs in terms of developing junior players for the senior game as demonstrated in Chapter 3, it is important to also consider cost effectiveness of individual TDEs within the broader talent system framework.

English rugby union provided a pertinent context to consider the influence of resource allocation on the effectiveness of TDEs. In this context, all regional academies are jointly governed at the macro-level by the RFU and PRL through a formal academy licensing agreement stipulating minimum operating standards. Although all academies receive central funding from the NGB, those affiliated with Premiership academies are mandated to augment this funding with a stipulated minimum investment. In practice, given that each Premiership academy is linked to an independent Premiership club business organisation, it is likely that the total investment into each academy beyond the minimum requirement varies. As a result, despite uniform expectations about provision and governance, there may be significant variation in the overall resources available across academy TDEs. This provides a unique opportunity to investigate how differential levels of

investment influence effectiveness within a regulatory framework of consistent operating standards and central investment.

As highlighted in Chapters 1 and 4, academy operations in English rugby union are restricted by defined geographical boundaries (Figure 1.1). This limits each academies' selection to players who live, attend school, or participate in club rugby (pre U13) within the designated boundary (Till et al., 2020). This constrains the depth of the talent pool available to each academy, a factor shown to influence selection practices in other contexts (Bennett et al., 2023). In the context of English rugby union, as highlighted in Chapter 4, a perceived critical external resourcing factor influencing player development outcomes are the number and quality of schools or colleges within each academy's regional boundary. The resources offered by schools, such as competitive match opportunities, coaching expertise, and athletic development will vary considerably, with the distribution of schools varying between academy boundaries. Therefore, to comprehensively investigate TDE effectiveness, it is essential to consider not only internal resource, such as financial investment and staffing, but also external resources such as the rugby union player talent pool, and schools associated with each academy boundary.

Given the substantial variation in the efficiency and effectiveness of the regional academies in English rugby union reported in Chapter 3, it is plausible that disparities in available resources, both internal and external, may impact the effectiveness of TDEs as reflected in the number of players developed. Indeed, Chapter 4 demonstrates that there are strongly held perceptions that the efficiency and effectiveness of the academy is influenced by the available talent pool within the academy boundary and schools. As such, this chapter aimed to understand the tensions between resource availability and TDE effectiveness. Specifically, the chapter aims were to a) compare the estimated financial cost associated with developing a male Premiership player between academy TDEs; b) examine associations between resource availability and the total number of players

developed; and c) explore associations between resources availability and the overall quality of players developed.

## **5.2 Methods**

### **5.2.1 Data sample**

#### *5.2.1.1 Resource data*

The financial spend of each academy and the number of academy staff was obtained from annual audit reports. As part of the academy licencing agreement, all academies were required to report their annual monetary spend against audit requirements, categorised into three cost centres: ‘staff costs’, which included salaries and employment-related expenditures for all full-time and part-time staff (e.g., coaches, medical professionals, analysts, and support personnel); ‘player costs’, which included salary payments to academy players, as well as expenses related to accommodation, kit, and player-specific support; finally, ‘programme costs’, referring to infrastructure and operational expenses such as facility hire, travel and equipment. Academies were also required to report the number of staff employed by the Premiership club to work in the academy. PRL shared academy financial audit data for seasons 2016/17 until 2023/24, and staff counts between 2017/18 and 2022/23 (prior to 2017/18 data were not collected). All financial data were adjusted for inflation using the Consumer Price Index (CPI), a standard economic measure that tracks changes in the average price level of a basket of goods and services over time. This adjustment ensures comparability of financial figures across different years by accounting for changes in purchasing power. All values are presented in 2023 GBP, using CPI data published by the UK Office for National Statistics (ONS, 2023).

In line with domain expectations, schools have been included as an academy resource. Specifically, the top 50 finishing rank schools of the U18 ‘Daily Mail Trophy’, a competitive league for British

schools, across four consecutive seasons were considered in analysis (2016/17 to 2019/20). Each school was assigned to an academy based on its location in relation to academy regional boundaries, ensuring alignment with the geographical allocation principles underpinning academy operations; schools not based in England were excluded. Additional school data was sourced from the RFU's Game Management System. This data included the number of schools within each academy boundary whose pupils were registered players. Schools competing in the RFU 'Academy Colleges and Education' (ACE) league, were not specifically considered in analysis.

Talent pool data was sourced from Game Management System, providing the total number of registered players within each academy boundary (known as 'playing population'). Otherwise, general population information was sourced from the 2021 UK Census (ONS, 2022), with the 15-19 year old male population for each academy boundary being calculated by cross-referencing UK unitary authorities with academy boundaries.

#### *5.2.1.2 Player data*

A comprehensive match dataset was provided by PRL, detailing Premiership league match appearances of ex-academy players, covering 2016/17 to 2023/24 seasons. PRL also provided academy registration data, detailing which academy players were registered each season. Both datasets were anonymised by PRL using an anonymisation key. Datasets were combined using the anonymisation key; allowing researchers to assess which Premiership players were previously enrolled in a regional academy, and how many Premiership appearances, to date, a player had achieved.

### 5.2.2 Inclusion/exclusion criteria

Given that the primary purpose of TDE organisations is to develop future high-performing athletes, it was decided to offset data used in analysis by considering past resources against future outcomes. Considering the regulatory stability of the English rugby union talent system between 2016/17 and 2023/24, I compared the academy resource inputs (finances, staff count, schools, and population) in the first half of this period (i.e. 2016/17 – 2019/20) to the academy outcomes (number of Premiership players, appearances achieved) in the second half (i.e. 2020/21 – 2023/24). Following the exclusion of one academy with incomplete audit data, thirteen academies were retained for full analysis. See Figure 5.1 for a schematic of the study. 90 out of a possible 104 academy registration lists between 2016/17 and 2019/20 were available for inclusion.

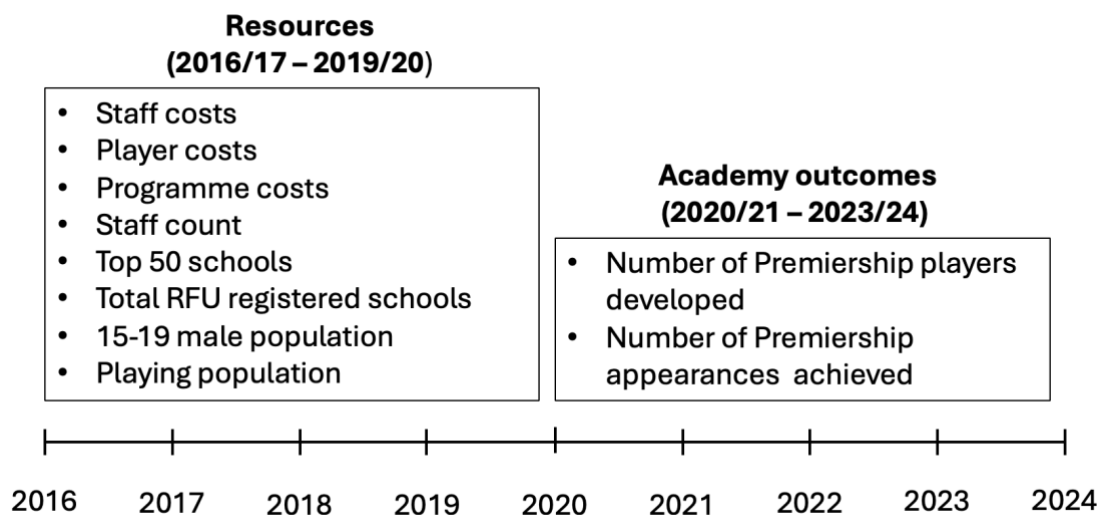


Figure 5.1 Dependent and independent variables and time offset

Players were included in analysis only if they had made at least one Premiership appearance and could be assigned to a junior academy, defined as having their initial academy registration during or before their U18 season between 2016/17 and 2019/20 seasons. In recognition of the substantial investment academies place on their U18 academy players relative to other age grades (per Chapter

4), it was decided to assign players based upon their U18 academy affiliation (Club A-N). Players were excluded from analysis if this data was unavailable. In total, 118 Premiership players were included in analysis.

### **5.2.3 Data analysis**

#### *5.2.3.1 Descriptive analysis*

Z-scores were calculated to standardise total financial input and number of Premiership players developed variables across clubs. This allowed a meaningful visual comparison on a common scale despite differences in absolute financial size or developed player volume. Considering efficiency, I attempted to ascertain the cost to develop a Premiership player during this time period. I calculated the cost per developed player by dividing total academy expenditure (sum of Staff, Player, and Programme costs; 2016/17-2018/19) by the number of players who made at least one Premiership league appearance (2020/21-2023/24). To reduce the impact of statistical noise, particularly among clubs with few developed players, I applied an Empirical Bayes shrinkage estimator (Efron & Morris, 1975). This method adjusts raw ratios toward the overall population mean based on the reliability of each club's estimate. This formulation balances observed variability with expected sampling error and is especially useful when club level sample sizes vary considerably. However, in our data, this calculation yielded an undefined value indicating that between club variance in raw cost per player was not distinguishable from sampling error. Accordingly, and in line with established practice (Gelman & Hill, 2006), I applied a conservative capped value of  $\tau=8$ , the median number of developed players per club year. Cost of development per academy was averaged between all academies to calculate the system-wide mean and standard deviation, from which the Z-score were calculated and plotted.

### 5.2.3.2 *Statistical analysis*

One-way ANOVA analysis was utilised to consider potential statistical differences between the ‘cost of development’ for each academy. Otherwise, a combination of correlation analysis and multiple linear regression were used to explore the relationship between academy resources (finances, staff count, population, and schools) and academy outcomes. Correlation analysis examined bivariate associations between financial variables, staff count, 15–19-year-old male population, top 50 schools, total schools, and the number of U18 debutants or total appearances. To identify the best predictors of player development, three sets of multiple linear regression models were constructed to evaluate predictors of academy effectiveness, operationalised as: (a) the number of Premiership debuts, (b) the total number of Premiership appearances made by these players, and (c) the cost of developing these players. For each outcome, two separate models were run. Model 1 included external demographic and participation variables: 15–19-year-old male population, playing population, and the total number of schools with registered rugby union players within each academy’s regional boundary. Model 2 included academy internal variables: academy’s staff, programme, and player costs, total staff count, as well as the number of the top 50 rugby performing schools within each academy’s regional boundary.

Multicollinearity was assessed using variance inflation factors (VIF). Due to strong intercorrelations among variables, external demographic and academy internal variables were analysed as separate models. Of the resulting analyses, all regression assumptions, including linearity, homoscedasticity, normality of residuals, and multicollinearity, were checked prior to interpretation. VIF values remained below 2.5 across all models, indicating no multicollinearity concerns. While some models were not statistically significant, diagnostics confirmed that the underlying regression assumptions were met, allowing for confident interpretation of the

coefficients and effect directions across models. All analyses were conducted using SPSS Version 29, with statistical significance set at  $p < .05$

### 5.3 Results

#### 5.3.1 Academy spend

Z-scores were calculated and plotted (Figure 5.2) to observe ratio between academy spend and number of Premiership players developed. Figure 5.2 demonstrates the variability between academy investment and number of players developed, with most academies falling within one standard deviation of the system-wide mean of each variable. Some academies presented a negative relationship between finances and player development. Those with less than average spend and greater than average Premiership debuts (i.e., Club H, Club G) demonstrate greater cost efficiency, compared to academies with greater than average spend and less than average Premiership debuts (i.e. Club A). Otherwise, some academies had a positive association between inputs and outputs.

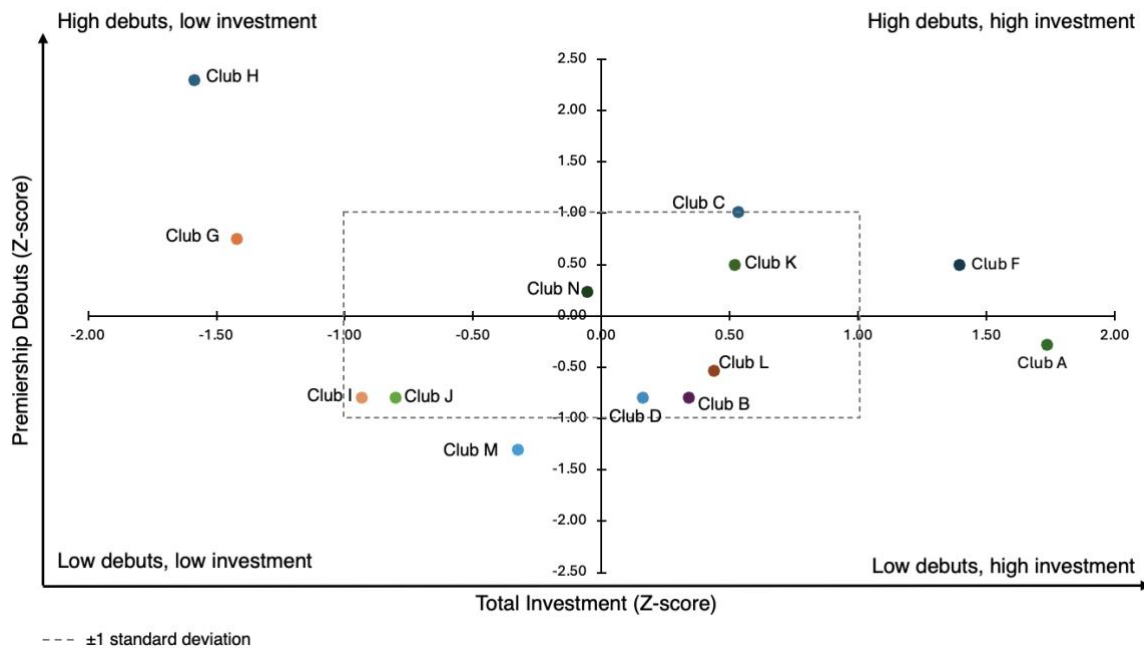


Figure 5.2 Z-score comparison of total financial investment and number of Premiership players developed by each academy

Overall correlations between resources and academy outcomes (Total Developed Players, Total Premiership Appearances) were calculated (Table 5.1). There were limited linear relationships between all resource variables and Total Developed Players. Considering Total Premiership Appearances, only total staff count had a significant correlation ( $r(56) = -0.354, p = .01$ ), albeit weak.

*Table 5.1 Correlation matrix of resource variables and academy outcome variables*

	Total Developed Players	Total Appearances of developed players
Playing population	-0.154	0.013
15-19 male population	-0.054	0.016
Total schools	0.041	0.161
Staff costs	-0.016	0.033
Player costs	0.059	-0.06
Programme costs	-0.159	-0.12
Total staff count	0.037	-0.354*
Top 50 schools	0.03	0.141
Total developed players	1	0.462*
Total appearances of developed players	0.462*	1

\*Correlation is significant

### **5.3.2 Cost of development**

The cost of development was calculated by dividing an academy's four-year total spend by the number of players to achieve a Premiership debut in the subsequent four-year period. Figure 5.3 illustrates the variability in cost of development between academies. Whilst there is considerable variability between clubs, a one-way ANOVA analysis indicated that these differences were non-significant ( $F(12, 30) = 1.740, p = 0.107, \text{Eta}^2 = 0.41$ ).

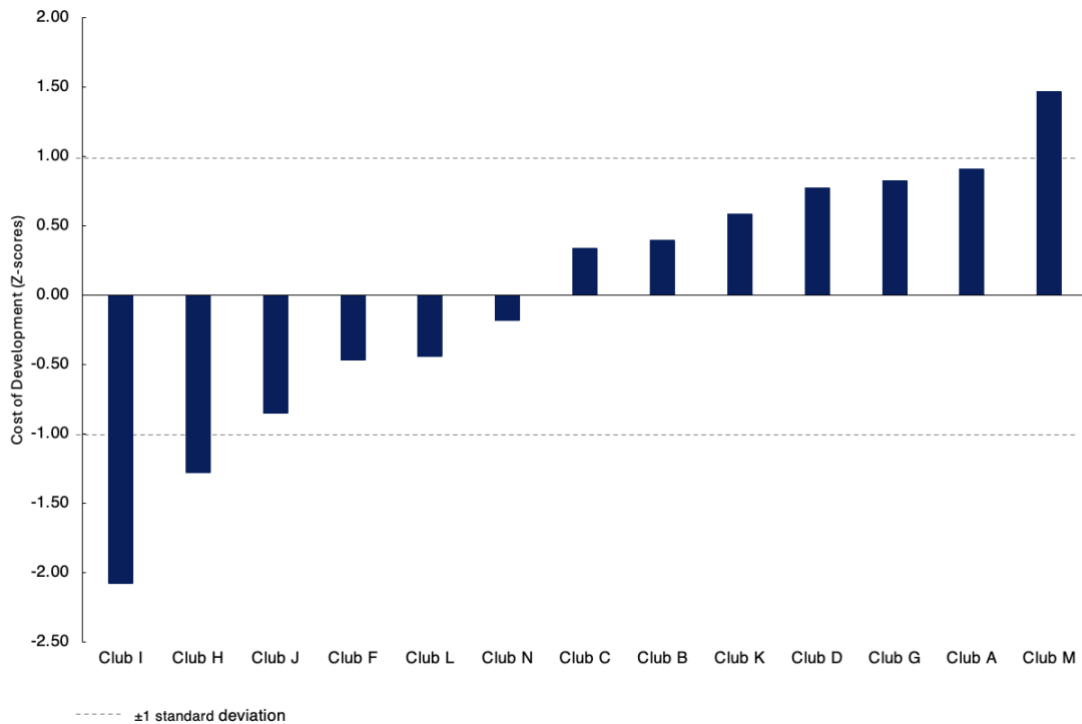


Figure 5.3 Range in ‘cost of development’ between thirteen academies represented by Z-scores. Arranged lowest to highest cost of development.

To examine the influence of resource variables on the cost of developing a Premiership player, a series of multiple linear regressions were conducted with the cost per developed player as the dependent variable. Given prior evidence of multicollinearity among contextual variables, predictors were divided into two thematically distinct models. The first model assessed external demographic factors including playing population, number of affiliated players, and total number of schools in each academy region. The overall model was not statistically significant ( $F(3, 39) = 1.425, p = .250$ ) and explained only 9.9% of the variance ( $R^2 = .099$ ). The second model examined the total cost of development, implementing Staff, Programme, and Player costs, Total Staff Count, and Top 50 Schools as predictor variables (Table 5.2). The model explained 19.2% of variance ( $R^2 = 0.192$ ), though it did not reach statistical significance ( $F(5, 37) = 1.763, p = .145$ ).

Table 5.2 Multiple regression models predicting Cost of Development

Variable	B	SE	95% CI	$\beta$	p
Model 1					
Constant	291,986.73	92,762.57	[104,356.72, 479,616.73]		0.003
Registered schools	-882.88	498.11	[-1890.40, 124.65]	-0.393	0.084
15-19 male population	49.27	30.04	[-11.49, 110.03]	0.374	0.109
Playing population	0.301	0.459	[-0.628, 1.231]	0.118	0.516
Model 2					
Constant	-34618.380	163815.387	[-366539.883, 297303.123]		0.834
Staff costs	0.353	0.248	[-0.149, 0.854]	0.243	0.163
Player costs	0.934	0.510	[-0.099, 1.967]	0.275	0.075
Programme costs	0.283	0.326	[-0.378, 0.944]	0.161	0.391
Total staff count	1620.974	5222.498	[-8960.813, 12202.761]	0.052	0.758
Top 50 Schools	-3172.042	10603.696	[-24657.171, 18313.087]	-0.045	0.767

Table 5.3 Multiple regression models predicting Number of Premiership Debuts

Variable	B	SE	95% CI	$\beta$	p
Model 1					
Constant	2.567	0.683	[1.194, 3.941]		<0.001
Registered schools	0.004	0.004	[-0.004, 0.012]	0.221	0.431
15-19 male population	-4.081	0.000	[0.000, 0.000]	-0.200	0.243
Playing population	0.000	0.000	[-0.001, 0.000]	-0.113	0.616
Model 2					
Constant	2.754	1.351	[0.034, 5.473]		0.047
Staff costs	-1.050	0.000	[0.000, 0.000]	-0.083	0.625
Player costs	1.289	0.000	[0.000, 0.000]	0.086	0.283
Programme costs	-4.281	0.000	[0.000, 0.000]	-0.161	0.646
Total staff count	0.003	0.043	[-0.083, 0.090]	0.013	0.938
Top 50 Schools	0.010	0.092	[-0.175, 0.194]	0.016	0.918

### 5.3.3 Influence of resources

To examine the influence of resource variables on the number of Premiership players developed, a series of multiple linear regressions were conducted with developed players as the dependent variable (Table 5.3). Given prior evidence of multicollinearity among contextual variables, predictors were divided into two thematically distinct models. The first model assessed external demographic factors. This model was not statistically significant,  $F(3, 48) = 0.767$ ,  $p = 0.518$ , and

explained minimal variance in debut counts ( $R^2 = 0.046$ ). The second model focused on internal academy inputs and structure, including staffing, programme, and player costs, total number of staff, and number of top 50 rugby performing schools. Again, the model was not statistically significant ( $F(5, 46) = 0.313, p = .903$ ), and explained just 3.3% of the variance in number of Premiership players developed ( $R^2 = .033$ ), with no predictors reaching significance.

Considering the total number of Premiership appearances achieved by developing players as the dependent variable, another series multiple linear regressions were conducted (Table 5.4). Given prior evidence of multicollinearity among contextual variables, predictors were divided into two thematically distinct models. The first model conducted to determine whether regional population, number of affiliated players, and number of schools predicted the total number of Premiership caps earned by developed players. The model was not statistically significant,  $F(3, 48) = 0.873, p = .461$ , and explained only 5.2% of the variance in total caps. None of the predictors reached significance.

The second multiple regression model was conducted considering *Staff Costs*, *Player Costs*, *Programme Costs*, *Total Staff Count*, and the number of *Top 50 Schools* as independent variables, with Premiership appearances achieved by developed players as the dependent variable (Table 5.4). Overall, the model explained 18.1% of the variance in Total Premiership Appearances ( $R^2 = 0.181$ ), but did not reach statistical significance ( $F(5, 46) = 2.029, p = .092$ ). Total Staff Count was the only variable to reach statistical significance ( $B = -2.168, p = .006$ ), with higher staffing levels associated with fewer Premiership appearances achieved by developed players. None of the financial variables, or the number of Top 50 Schools within academy boundaries, significantly predicted the number of Premiership appearances.

Table 5.4 Multiple regression predicting number of Premiership appearances

Variable	B	SE	95% CI	$\beta$	p
<b>Model 1</b>					
Constant	23.488	13.068	[-2.72, 49.70]		0.079
Registered schools	0.119	0.074	[-0.03, 0.27]	0.346	0.113
15-19 male population	-0.004	0.004	[-0.012, 0.004]	-0.225	0.316
Playing population	-1.298E-5	0.000	[-0.00014, 0.00011]	-0.033	0.845
<b>Model 2</b>					
Constant	20.141	23.869	[-27.905, 68.186]		0.043
Staff costs	2.293	0.000	[0.000, 0.000]	0.095	0.546
Player costs	3.492	0.000	[0.000, 0.000]	0.122	0.461
Programme costs	-5.175	0.000	[0.000, 0.000]	-0.102	0.479
Total staff count	-2.168	0.756	[-3.691, -.646]	-0.442	0.006
Top 50 Schools	1.347	1.620	[-1.914, 4.607]	0.114	0.410

## 5.4 Discussion

### 5.4.1 Aims

This chapter aimed to understand the tensions between resource availability and TDE effectiveness. Specifically, the chapter aims were to a) compare the estimated financial cost associated with developing a male Premiership player between academy TDEs; b) examine associations between resource availability and the total number of players developed; and c) explore associations between resources availability and the overall quality of players developed.

### 5.4.2 Cost of development

Z-scores (Figure 5.3), depicting the ratio of total financial investment versus the total number of Premiership players developed, demonstrates the variability within the talent system. Whilst ANOVA analysis indicated no significant differences in ‘cost of development’ between academies, the large effect size may indicate practical differences. Overall, results suggest some academies were achieving greater ‘bang for buck’. Financial variables were not significant predictors of ‘cost of development’, suggesting that the number of players developed is the controlling variable in this equation. Consequently, attention should be directed toward the factors that influence the junior-

to-senior transition (Stambulova et al., 2007) as well as the opportunities available to players, including access to senior contracts and matchday squad selection (Chapter 4). Albeit non-significant, higher programme costs were associated with greater ‘cost of development’, suggesting potential inefficiency where higher operational spending does not translate into an increased number of players developed. Future research may seek to understand the potential influence of centralised TD programmes or associated professional club assets, such as training facilities, on TDE costs and effectiveness.

### ***5.4.3 Influence of resources***

The results of this study suggest a minimal and non-predictive relationship between academy resources and the number of Premiership players developed by academies in this cohort and period of time. This contrasts previous research which suggests financial resources are preconditions that underpin both TDE practice (Henriksen et al., 2010a) and the macro-level of the talent system (De Bosscher et al., 2009). The present findings proffer that how financial resources are utilised to support developmental processes may be more important than total investment (Truyens et al., 2016). In this sense, Premiership academies with greater financial spend do not seem to be inherently advantaged over low spending Premiership academies. While this study could not directly capture programme quality, it is likely that the effectiveness of a TDE is shaped by how resources are leveraged. For example, the regression analysis indicated that staff count was negatively associated with effectiveness as represented by the number of Premiership appearances. As such, future research may consider how human resource factors (such as staff quantity and quality) may influence player developmental experience and TDE effectiveness.

In terms of academy boundary population variables, neither the 15–19-year-old male population nor the talent pool was significantly associated with TDE effectiveness. Whilst the influence of

talent pool size has received limited attention in rugby union, in other contexts it has been suggested that international success may be partially characterised by a large talent pool and participation rates (Bennett et al., 2019). Whilst this study cannot account for how the talent pool may have influenced initial selection decisions (Bennett et al., 2023), the results suggest that within this context academy TDEs are not inherently advantaged or disadvantaged by population factors associated with the academy boundary. However, other sports organisations (e.g., soccer or rugby league academies) operating within the same region may compete for talent pool and population, with possible implications for rugby union academies and players.

Perhaps most surprisingly, despite the strong perceptions conveyed in Chapter 4 that schools influence English rugby union player development, this study found no meaningful association between the presence of sampled top-performing rugby schools and academy effectiveness. These findings go towards challenging prevailing practitioner assumptions that the quantity and quality of rugby schools within their boundary impacts directly impacts academy outcomes. However, Chapter 4 suggests rugby schools support attending players, enabling academies to allocate resources to others more effectively. Otherwise, whilst results indicate schools do not seem to impact academy outcomes, they may impact the player's developmental experience (c.f. Phibbs et al., 2018). As such, these results may suggest the extent of the alignment and integration between academy and school rugby programmes, and the coherence of the athlete's developmental experience, may be a more important to player development and academy outcomes than the presence and proximity of rugby playing schools alone. This finding challenges a persistent narrative in English rugby union TD, and informs practice by providing a data informed insight into the role multiple environments may play on TD.

#### **5.4.4 Limitations**

Whilst this study has several strengths, such as the offset between resource input and academy outcomes, and the financial inflation adjustments, it is important to acknowledge several limitations. The missing registration lists mean it is likely I have not captured all the Premiership players developed by the academies. Through only considering players who appeared in Premiership league fixtures, I have not considered other English professional club competitions, such as Premiership Cup or Champions Cup. The recency of the dataset also means that the Premiership appearances metric is unlikely to cover the full scope of a player's Premiership career; a more comprehensive analysis may be possible in the years to come. It is also important to consider the unique contextual circumstances of male English rugby union when considering transferability to other systems (Gavin et al., 2024), therefore wider generalisability would be inappropriate. Whilst it was found school distribution (Top 50 Daily Mail trophy, and total rugby schools) did not seem to impact academy outcomes, ACE colleges were not sampled in this study. Otherwise, the educational background of the sampled Premiership players was not considered in this analysis.

There are possible other resource and contextual factors which may influence the effectiveness and efficiency of the academies which were not taken into consideration in this study. As discussed earlier, resources include intangible factors such as culture and time. Future research may wish to consider how the assessment of the academy environment via the Talent Development Environment Questionnaire (TDE-Q; Li et al., 2015; Martindale et al., 2010) may contribute to statistical models of efficiency and effectiveness. Whilst it would not be possible to ascertain the total time individual athletes spent training due to the concurrent environments players may be involved with, it may be beneficial to consider the total within-season training and match hours offered by each academy. Otherwise, as for contextual resources, the study did not consider the potential influence of the geographic size of each academy boundary, the relative population/talent

pool density (e.g., number of players per square kilometre), or the number of local rugby union clubs including those involved with tier 2 and 3 English rugby competitions. Future research may wish to take these factors into consideration.

## **5.5 Conclusion**

Overall, this study has indicated that, when considered in isolation of context, resource availability does not seem to explain academy TDE effectiveness. Results suggest that academy TDEs are not necessarily (dis)advantaged based upon their resource availability. I would suggest that the focus should be on how resources can best be utilised to support athlete development within each regional academy context. In this sense, strategic decision making, organisation factors, and macro-system factors may be more critical for academy TDE effectiveness. Whilst causation cannot be inferred, this study highlights it is perhaps not what academies have, but rather how they use it, which drives effective TD. An important implication for PRL is that the regional boundaries, designed to encourage the academies' investment into developing players within their regions, do not seem to influence the outcomes of TD despite having uneven geographical distribution, talent pool and high-performing school distribution. Considered alongside the results of Chapter 4, this policy is adaptive for development.

## **Chapter 6: Hares, Tortoises and Falcons - An exploration of academy player pathway archetypes resulting in English Premiership Rugby**

Chapter 2 highlighted that evaluating the effectiveness of a talent system to be a complex task with many different approaches. Whilst Chapter 3 investigated the effectiveness of the talent system by considering the outcome of the talent system via conversion rates, there is still a need to consider the processes of the talent system – i.e. *how* do players progress to the Premiership. This is needed so that macro-organisations can have a greater understanding of how the talent system is functioning and not just if it is functioning. As such, the study presented in this chapter aims to consider processes of development. This would enable the macro-level organisations to better support TD across the broad context of the talent system.

### **6.1 Introduction**

TD aims to promote junior athletes towards senior elite competition, with athletes being advanced through talent systems that provide structure to their development and progression. The journey from junior to senior elite performance is widely regarded to be typically non-linear, reflected both in the inevitable setbacks in an individual's progression (Papastaikoudis et al., 2024; Williams & MacNamara, 2022) and that the highest performing junior athletes rarely become the highest performing senior athletes (Barth et al., 2023; Güllich et al., 2023). As such, TD research has aimed to understand a vast array of factors influencing athlete progression, often with the aim of informing practitioner and policy decision making (e.g., Kelly, Jackson, et al., 2021).

Despite the non-linearity of development, metrics utilised to evaluate progression typically do not reflect this. As discussed in chapters 2 and 3, conversion rates are a commonly utilised metric denoting the proportion of athletes to progress to the senior elite level. Conversion rates have been

utilised to assess the impact of factors such as relative age (Brustio, Stival, et al., 2023; Kelly et al., 2020) on progression, and were used in Chapter 3 to demonstrate variation between different TDEs. Conversion rates are widely utilised due to their simplicity in calculation and evaluation, however, as argued in Chapter 3, they must be used judiciously. Whilst offering a simplistic metric to assess ultimate progression and compare between groups by comparing ‘inputs’ to ‘outputs’, they are somewhat limited in ability to reflect the complexity of progression and development, and do not capture the non-linearity of development.

Research has begun to consider *how* athletes progress through talent systems. Considering the variation in pathways through the talent system may help inform and innovate policies and practices that better support player progression. Whilst it is well acknowledged that development is non-linear, there is growing recognition of just how much variability there is between players’ development pathways. In soccer for example, Verbeek et al., (2025) observed that whilst 7.7% of Dutch academy players attained senior elite status by age 23, there were 446 unique academy player career development patterns, with the majority of players reaching senior elite level experiencing deselection along their pathway. In a multisport study, Gulbin et al. (2013) observed fewer than 7% of sampled athletes experienced consistent linear progression; the vast majority of elite athletes progressed non-linearly, experiencing a form of regression in relative competition standard when transitioning between junior and senior performance. However, in some sports this may be by design; in soccer and rugby union, for example, lower league loan clubs are often utilised to support the development of newly contracted senior athletes.

Whilst a multitude of factors has been shown to influence which athletes ultimately progress to the senior elite level, it is yet to be considered in tandem with *how* athletes progress. As discussed in Chapter 2, research into relative age effects has considered the likelihood of an athlete’s ultimate

progression to the senior elite level based on athletes' birth quartile, implying that birth quartile is associated with different progression types. Across multiple sports and contexts, athletes whose birthdate is close to the start of the selection year are disproportionately selected into talent systems. However athletes born late in the selection year would seem to be relatively more likely to progress to the senior elite level (Brustio, Stival, et al., 2023; Kelly et al., 2020; McCarthy et al., 2016). With player development opportunities associated with their relative age (Kelly, Jackson, et al., 2021), a relatively older player's progression to the senior elite level may be different to that of a relatively younger player. As such, there is a need to consider how factors influencing ultimate progression may also influence the player pathway.

As such, research has considered factors influencing progression and have considered differences in how athletes progress. However, the complexity of developmental pathways presents a unique challenge in that we lack sufficient empirical understanding of how multiple factors interact and influence progression patterns. To that end, typical statistical methods have proven inadequate for capturing the inherent complexity of developmental pathways. The emergence of more advanced machine learning techniques may offer an appropriate approach to examine such complex TD research questions (Baker et al., 2025). These methods are designed to identify underlying patterns within large datasets making them well suited to exploring the multifaceted nature of TD. To date, machine learning has been utilised to create predictive models in TD contexts and is primarily applied to build predictive models that classify or forecast athlete outcomes based on various characteristics. For example, Bayesian machine learning was implemented in regional Welsh rugby union to develop predictive models for distinguishing between selected and non-selected players based upon physiological and psychosocial variables (Owen et al., 2022); physiological and psychosocial models correctly classified the selection status of 67.55% and 62.26% players respectively. Similarly in cricket, Jones et al. (2019) developed a predictive model to classify

batsmen between ‘elite’ and ‘super-elite’ classifications with an accuracy of 96%, identifying 18 particularly predictive variables. Otherwise in English soccer, Kelly et al., (2022) utilised machine learning to examine factors contributing to player review ratings of U9-U16 academy players, and the characteristics of selected and non-selected U18 players. Whilst these examples demonstrate the predictive power in machine learning in TD thus far, the techniques also hold promise for identifying patterns in TD data.

Unsupervised machine learning, particularly cluster analysis, allows researchers to detect naturally occurring patterns without relying on predefined outcome variables. For example, Raabe et al. (2023) proposed machine learning methodology to consider tactical patterns in invasion games. Whereas, aiming to optimise talent transfer, Teunissen et al. (2024) utilised unsupervised cluster analysis to group different sports based upon environment similarities, task, and athlete characteristics; 34 sports were organised into five distinct clusters based upon their features. This capacity for exploratory analyses is particularly valuable in TD research, where theoretical models of progression remain underdeveloped. By moving beyond the assumption that developmental structures are already fully understood, unsupervised machine learning may offer an appropriate tool to consider the different ways athletes progress through talent systems.

### ***6.1.1 Current study***

As outlined in Chapter 1, in the context of English rugby union, male player selection and development is delivered via a regional academy system, with each academy designated a geographical boundary to operate within (Till et al., 2020; Figure 1.1). The talent system can be divided into two main phases, junior academy and senior academy. Initial selection into the junior academy may occur from age grade under-16 (U16), with players being selected into PDG and typically remaining until under-18 (U18). At this point, a small selection of players will be offered

senior contracts, transitioning them into the senior academy to continue their development. Players may remain in the senior academy until their under-24 season. Given the significant differences between junior and senior performance (Argus et al., 2012), often senior academy players are loaned to lower league clubs to supplement their development and expose them to lower level senior competition (i.e. RFU Championship, National League One, and National League Two). As highlighted in Chapter 4, player loan opportunities may depend on several factors including proximity to Premiership club.

Chapter 3 demonstrated the significance of EAP status in likely progression to the Premiership. England eligible junior academy players considered by their academy to have the greatest potential to become a senior elite player may be nominated as an EAP. Alongside receiving an elevated status, these players also receive greater resourcing to support their development, with provision often beyond which is offered to their non-EAP peers. If selected into the senior academy, these players maintain this status. Otherwise, England eligible players who did not obtain EAP status in the junior academy but progress to the senior academy may become an EAP upon transition. Chapter 3 found that when a player becomes an EAP significantly influences likelihood of a Premiership appearance, however there is still a need to consider if EAP status influences how players progress.

As briefly discussed in Chapter 4, some playing positions may require extra time and resource to continue development during the early stages of their professional career. Positional physical differences between forwards and backs are well documented (van Gent & Spamer, 2005; Wood et al., 2018; Zabaloy, Giráldez, et al., 2022), and have been observed between tiers of competition (Fontana et al., 2015; Hamlin et al., 2021; Smart et al., 2013). TD research focusing on positions have typically focused on characteristics of forwards and backs alongside selection status (e.g.,

Dimundo, Cole, Blagrove, McAuley, Till, & Kelly, 2021; Owen et al., 2022). Whilst Kearney (2017b, 2017a) observed some birth quartile differences between senior forwards and backs, suggesting there may have been differential developmental trajectories between different playing positions, research has not explicitly considered how a player's position may influence how they progress.

Given the timing of EAP status, the lower league loan club opportunities, the different academies, and different Premiership clubs, there are multiple ways a player may progress through the talent system to the senior elite level. Being able to quantify the different routes through the talent system may provide beneficial insight for the design and resourcing of the talent system. Unsupervised machine learning may offer an appropriate approach to analyse player journeys and influencing factors, being able to explore complex interactions and inherent groupings within datasets without biases, it may offer meaningful insights into TD in this context. This chapter aimed to quantify different journeys through the talent system which result in at least one Premiership appearance. Specifically, the aims of this chapter were to a) utilise unsupervised cluster analysis to explore patterns of player progression through the male English rugby union talent system which result in the Premiership; and b) consider potential differences in relative age, playing position, academy, and Premiership club between player journey types.

## **6.2 Methods**

### ***6.2.1 Data sample***

This study utilised a retrospective analysis of the academy system and the English Premiership league. Academy data were sourced from seasonal EAP registration and release lists, detailing the player's academy and date of birth. By cross-referencing first EAP registration season with date of birth, it was possible to ascertain age-grade of nomination. I decided not to incorporate PDG data

in this analysis due to the lack of seasonal data across academy organisations. PRL also shared a comprehensive match dataset with match data pertaining to ex-academy players in domestic English rugby competitions, including Premiership, RFU Championship, National League One, and National League Two. PRL anonymised all data, with all players given a unique identification code. EAP registration and match dataset data were combined utilising these identification codes to create the study dataset mapping player progression.

### **6.2.2 *Inclusion/exclusion criteria***

The overarching aim of this thesis was to consider the development of Premiership players through the English rugby union talent system. As such it was decided to only consider data pertaining to players who were registered in a junior or senior academy (per inclusion on EAP registration lists) and who achieved at least one Premiership match appearance. Reflecting the methods in Chapter 3, it was decided to only include players first registered in the academies from the 2012/13 season onwards due to EAP policy instantiation in 2010/11. Players who were unused substitutes in Premiership matches and did not accrue any Premiership match minutes were excluded. As such this study only included players who accrued Premiership playing time in a starting team or who appeared as a substitute. Players without birthdate information were excluded from analysis. The final sample consisted of 407 players.

### **6.2.3 *Player Data***

#### **6.2.3.1 *Development stages***

EAP registration and release lists considered whether player held EAP status in the junior and/or senior academy. As described in Chapter 3, junior EAP stage corresponded to registration  $\leq$ U18, whereas senior EAP stage corresponded with registration  $>$ U18. NL stage considered player starting or substitute appearances in National League 1 or 2 fixtures (combining National League

1, and National League 2 North, East, and West). It was decided not to differentiate between National League in this current study, as such National League 1 and 2 are collectively referred to as ‘National League’ (NL). Championship stage considered player starting and substitute appearances in Championship fixtures. NL and Championship fixtures where players were unused substitutes were not included in analysis. As such, in this analysis of player journeys to the Premiership, player stages may include the following: Junior EAP, Senior EAP, NL, and Championship.

*Table 6.1 Playing position, categories, and number per starting 15 match-day players*

Playing Position	Number of players per starting 15	Position Category
Prop	2	Forwards
Hooker	1	
Lock	2	
Back Row	3	
Scrum-Half	1	Backs
Fly-Half	1	
Centre	2	
Wing	2	
Fullback	1	

#### *6.2.3.2 Position*

Player’s position was considered in two ways. To begin, positional roles were classified between ‘forward’ and ‘back’ categories (see Table 6.1). Secondly, nine playing positions in a match day squad were considered: prop, hooker, lock, back row, scrum-half, fly-half, centre, wing, and fullback. Whilst players may move between playing positions (most typically within forward and back classifications) it was decided to consider position as a static variable for the purposes of this analysis. Position was attributed by their most common starting position in the Premiership. If a player only achieved Premiership appearances as a substitute, their position was classified by the most common position they substituted. Table 6.1 also shows the position composition of the

starting 15 players on a match-day squad. Whilst up to 23 players may play in a single match for a team, the position composition of the eight substitute players is not standardised.

#### *6.2.3.3 Academy and Premiership club*

Given the limitations previously highlighted regarding assigning players to an academy based upon specific age-grade with the missing data, it was decided to assign players to the academy initially associated with the player in EAP registration or release lists (Academy Club A-N). It was also decided to consider the Premiership club players made their debut with (start or substitute) in the Premiership (Premiership Club A-N). This allowed a consideration of whether players change organisation to progress to the Premiership.

#### *6.2.3.4 Birth quartile*

To consider potential relative age differences with player progression, birth quartiles (BQs) were considered. Aligning with the English annual age-group cut-off dates (September 1<sup>st</sup> – August 31<sup>st</sup>), the selection year was divided into quartiles consisting of three calendar months. Starting September 1<sup>st</sup>, the quartile dates were as follows: Q1 = Sep 1<sup>st</sup> – Nov 30<sup>th</sup>; Q2 = Dec 1<sup>st</sup> – Feb 28<sup>th</sup>; Q3 = Mar 1<sup>st</sup> – May 31<sup>st</sup>; Q4 = Jun 1<sup>st</sup> – Aug 31<sup>st</sup>. Each player was assigned a quartile corresponding with their month of birth.

#### **6.2.4 Data limitations**

This analysis was limited to the data available in the datasets. The match dataset did not include English domestic competitions below National League 2 (i.e. Regional or County tier competitions) and did not include British Universities and Colleges (BUCs) rugby union competitions. As highlighted in Chapter 4, for some academies, BUCs competitions is utilised to accrue game time for senior academy players in lieu of National League and RFU Championship competitions. The

match dataset did not include international fixtures, nor non-English competitions such as the United Rugby Championship, Scottish Premiership, or French Top 14. Therefore, player progression in competitions external to Championship and NL One and Two could not be considered. As highlighted throughout this thesis, the missing registration data limited the analysis. The extent of the missing PDG data as highlighted in Table 1.2 meant that this dataset was entirely excluded from this study as it had potential to skew unsupervised cluster analysis. Data pertaining to DPP involvement (the pre-academy development stage) was also not available during this study. As such, this study could not capture the full player journey through the talent system. The incompleteness of the EAP registration and release lists also means that other factors potentially influencing development, such as school type, could not be considered.

## **6.2.5 Analysis**

### *6.2.5.1 Mapping player pathways*

This study aimed to compare the different journeys players make through the talent system, from the academies to the Premiership. The study dataset chronologically listed each season players appeared in EAP registration/release lists and NL and/or Championship matches up until their Premiership debut. Each season players spent in a stage was counted to map their journey, whereas the time difference between start season and Premiership debut season was considered total development time. See figure 6.1 for a visualisation of a sample player.

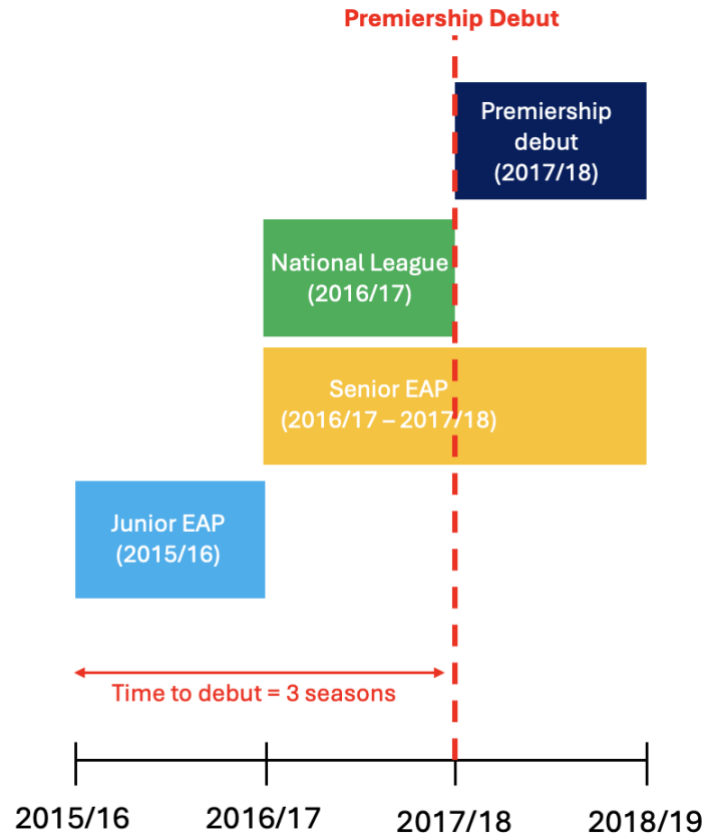


Figure 6.1 Map of an example player's progression from the academy to Premiership.

As demonstrated by Figure 6.1, this player was initially registered as an EAP in the 2015/16 season, aligning with their U18 season as per date of birth, and first appeared in the Premiership during the 2017/18 season. As such, this player debuted in the Premiership in their third season. Between initial EAP registration and Premiership debut, this player accrued one season as a junior academy EAP, one season as a senior academy EAP, and one season in NL, with no Championship appearances. Whilst this player has totalled seven seasons in the Premiership and accrued five seasons as a senior EAP, events were only considered up to Premiership debut. Each of the 407 players in the sample had their journeys mapped to Premiership debut, denoting their Total Time, Junior Academy EAP Count, Senior Academy EAP Count, Championship Count, and NL Count.

### **6.2.6 Statistical analysis**

All statistical analyses were conducted using IBM SPSS Statistics (Version 29), with statistical significance set at  $p < 0.05$ . The aim was to explore the developmental pathways of players who progressed through the academy setting to play Premiership rugby. In order to do this, a multi-step, exploratory approach was adopted to identify, describe, and interpret patterns of player development based on time in the system, academy affiliation, lower league competitive exposure, Premiership club destination, position, and birth quartile.

#### *6.2.6.1 Cluster analysis*

To classify players into meaningful developmental typologies, a hierarchical cluster analysis using Ward's method and squared Euclidean distance was first conducted on a set of standardised continuous variables: total years in the system from first EAP appearance in academy to Premiership debut, and count exposures at each developmental stage (Junior Academy EAP, Senior Academy EAP, NL, and Championship). Visual inspection of the dendrogram and agglomeration schedule supported a three cluster solution. This solution was validated and refined through a K-means cluster analysis, with the number of clusters fixed at three to minimise within-group variance and optimise between-group differences.

#### *6.2.6.2 Descriptive and group comparisons*

Descriptive statistics were calculated for each cluster, including means and standard deviations. To assess associations between cluster membership and categorical variables, including position (category and role), Academy Club, Premiership Club, and birth quartile, a series of Pearson's chi-square tests of independence were conducted. Where significant relationships were found, follow-up crosstabulations were used to examine proportional distributions within each category. Adjusted standardised residuals were reviewed to identify which cells contributed most to the observed

significance, with values  $> \pm 1.96$  indicating statistically meaningful deviations from expected counts.

### *6.2.6.3 Ordinal trend analyses*

For ordinal data where an overall chi-square was non-significant, a linear-by-linear association chi-square test was used to explore the presence of a trend in the distribution of categorical data across clusters. For example, considering birth quartile, this analysis allowed for the identification of potential subtle developmental biases linked to relative age, even where categorical differences were not statistically significant.

## **6.3 Results**

### *6.3.1 Cluster composition*

To explore whether distinct pathways exist among players who progressed to Premiership rugby, a hierarchical cluster analysis was initially conducted using Ward's method with squared Euclidean distance as the measure of similarity. The input variables included in the cluster solution were as follows: total years in the system from first EAP appearance in academy to Premiership debut, count exposures at each developmental stage (Junior Academy EAP, Senior Academy EAP, NL, and Championship), and club continuity (same club from academy to Premiership). These variables were standardised (Z-scores) prior to analysis to account for differences in scale. The agglomeration schedule and dendrogram were inspected to determine the optimal number of clusters. Inspection of the agglomeration coefficients indicated a marked increase in heterogeneity at the three cluster solution, suggesting this was the most appropriate point to retain a meaningful structure while preserving interpretability. This interpretation was supported visually by the dendrogram, which revealed clear separation among three main groupings of players.

To validate and refine the groupings identified in the hierarchical cluster analysis, a K-Means Cluster Analysis was subsequently performed, specifying three clusters and using the same standardised variables. The K-Means procedure was chosen for its ability to iteratively optimise cluster centroids and assign cases to clusters in a way that minimises within-cluster variance. The K-Means output confirmed the presence of three distinct clusters, with clear separation in mean values across the variables for each cluster. Table 6.2 describes the temporal and structural differences between clusters, and Figure 6.3 depicts sample player journeys from each cluster.

*Table 6.2 Comparison of clusters for total years, stage count, and if player academy is same organisation as Premiership debut club*

Variable	Cluster 1 (n = 204)	Cluster 2 (n = 108)	Cluster 3 (n = 95)
Total Years	3.81 ± 1.23	5.05 ± 1.48	2.19 ± 1.01
Count Junior Academy EAP	1.98 ± 0.83	0.92 ± 0.98	0.00 ± 0.00
Count Senior Academy EAP	0.85 ± 0.84	1.70 ± 1.26	0.14 ± 0.42
Count NL	0.13 ± 0.38	1.61 ± 1.88	0.17 ± 0.50
Count Championship	0.17 ± 0.50	3.28 ± 2.62	0.39 ± 0.91
Same Club (%)	92.2%	63.9%	84.2%

Descriptive ANOVA tests indicated statistically significant differences between clusters for all included variables (all  $p < .001$ ). For example, Count Junior Academy EAP differed substantially across clusters ( $F(2,404) = 224.53$ ,  $p < .001$ ), with Cluster 1 having the highest average exposure. Similarly, Count Championship exposure was notably higher in Cluster 2 ( $F(2,404) = 171.96$ ,  $p < .001$ ). However, these results should be interpreted descriptively rather than inferentially, as cluster membership was derived from these very variables and the tests serve to describe, not confirm, group differences. Based on the final cluster centres and cluster sizes, three distinct player pathway types were identified and are described below, with Table 6.2 depicting temporal and structural differences between clusters. Through comparing these descriptive statistics, it is possible to ascertain differences between the clusters in how players progress.

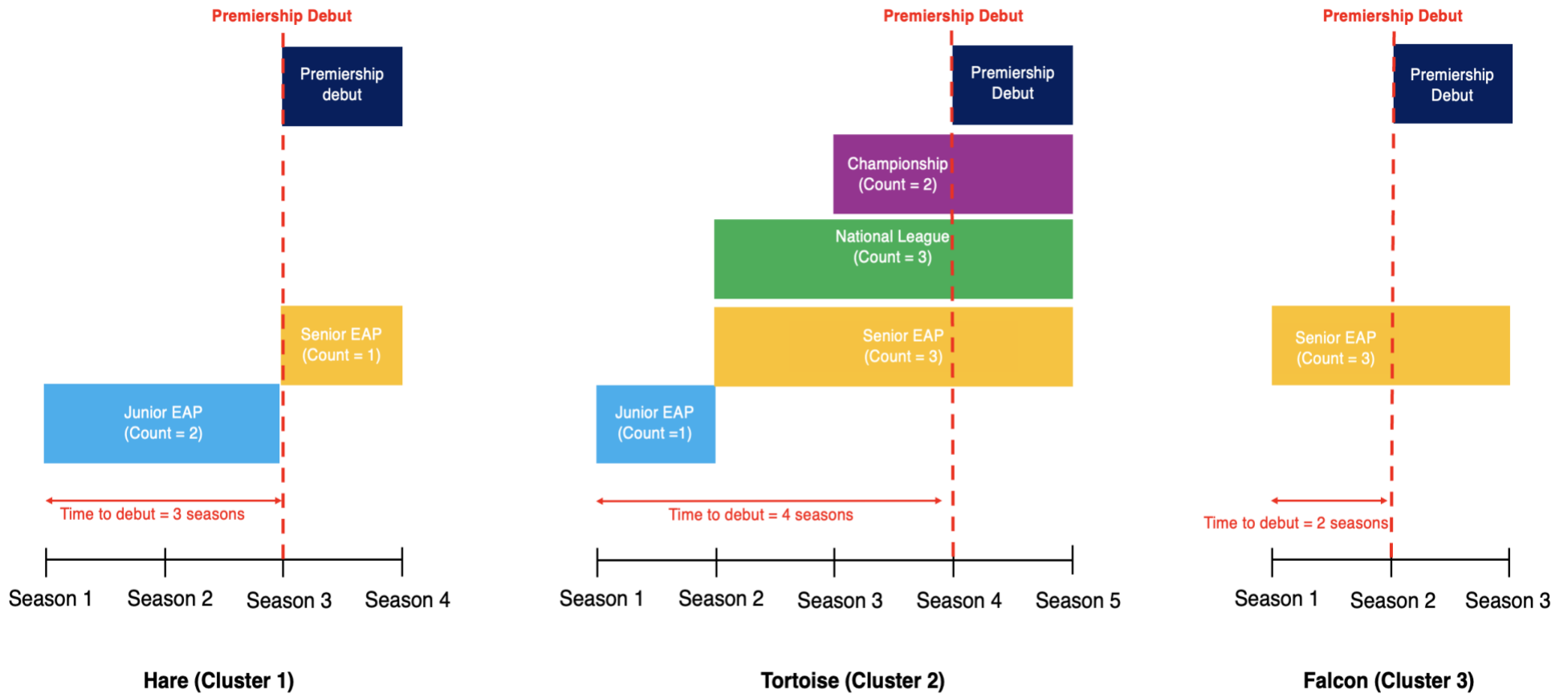


Figure 6.2 Journeys of three example players who are included in Cluster 1, Cluster 2, and Cluster 3 respectively

#### *6.3.1.1 Cluster 1: Hares - early identified and quick progression*

Cluster 1 (Hares) is typified by the highest average count of Junior Academy EAP seasons. This cluster also had the lowest counts of NL and Championship. 92% of players in this cluster achieved a Premiership debut with the same organisation who initially nominated them as an EAP. Whilst this cluster has a moderate Total Years value, this cluster has the highest count of U18 data (Junior Academy EAP), meaning this total time is spread between junior and senior cohorts. This cluster, on average, represents players who were identified EAP early in the junior academy and achieved their Premiership debut early in their senior career. Hares accounted for 50.12% of the sample.

#### *6.3.1.2 Cluster 2: Tortoises - slow, meandering progression*

Cluster 2 (Tortoises) has the largest average Total Time value; players on average took five years to achieve a Premiership debut after initial EAP registration. This cluster had a <1 average Junior Academy EAP count, and the largest average Senior Academy EAP count. The standard deviations of the EAP count variables are also large compared to Cluster 1 and Cluster 3, denoting greater variability within the cluster. This cluster is typified by the substantially higher count of lower league involvement, with the highest average counts of NL and Championship seasons. As such, this cluster is overall the slowest to progress and is characterised by players being nominated EAP late in the junior academy and who had greater lower league involvement prior to Premiership debut. Tortoises accounted for 26.54% of the sample.

#### *6.3.1.3 Cluster 3: Falcons - late identified but quick progression*

Cluster 3 has the lowest average Total Time between initial EAP nomination and Premiership debut. No players in this cluster were nominated an EAP in the junior academy, with Junior Academy EAP count at zero. As such, Total Time refers exclusively to players' senior career. This cluster also has the lowest average count of Senior Academy EAP seasons, and moderate average

NL and Championship seasons. As such, this cluster represents players, who either entered the talent system late or were not identified EAP until offered a senior academy contract, but who also, on average, had a direct progression to Premiership. Falcons represent 23.34% of the sample.

### 6.3.2 *Player demographic data*

#### 6.3.2.1 *Position*

Table 6.3 shows the distribution of Forward and Back position categories between clusters. Pearson Chi-Squared suggested that there was no significant relationship between the positional categories and cluster group ( $\chi^2(2) = 3.614$ ,  $p = 0.164$ ). Cluster groups are not proportionately made up of a greater amount of either forwards or backs

*Table 6.3 Distribution of forwards and backs between clusters*

Position Category	Total N=	Proportion of sample (%)	Cluster 1 Distribution		Cluster 2 Distribution		Cluster 3 Distribution	
			N=	(%)	N=	(%)	N=	(%)
Back	182	44.72%	100	49.02%	41	37.96%	41	43.16%
Forward	225	55.28%	104	50.98%	67	62.04%	54	56.84%

Pearson chi-squared also considered the distribution of playing position between the three clusters, finding a significant association ( $\chi^2(16) = 28.041$ ,  $p = .031$ ). Table 6.4 demonstrates the distribution of playing position between clusters. Further inspection of adjusted standardised residuals highlighted several key patterns. Players in the back row (2.20) and centre (2.10) positions were significantly more likely to fall into Cluster 1, while props (-2.00) were underrepresented. Hookers (2.50) were overrepresented in Cluster 2, and there were also emerging trends for props (1.50) and wings (1.40) to be more prevalent in cluster 3.

Table 6.4 Distribution of playing position between clusters and adjusted standardised residuals

Position	Total N=	Proportion of Sample	Cluster 1		Cluster 2		Cluster 3	
			N=	Distribution (%)	N=	Distribution (%)	N=	Distribution (%)
Prop	58	14.25%	22	10.78%	18	16.67%	18	18.95%
<i>Adjusted Standardised Residual</i>			-2.00		0.80		1.50	
Hooker	36	8.85%	14	6.86%	16	14.81%	6	6.32%
<i>Adjusted Standardised Residual</i>			-1.40		2.50		-1.00	
Lock	53	13.02%	20	9.80%	19	17.59%	14	14.74%
<i>Adjusted Standardised Residual</i>			-1.90		1.60		0.60	
Back Row	78	19.16%	48	23.53%	14	12.96%	16	16.84%
<i>Adjusted Standardised Residual</i>			2.20		-1.90		-0.70	
Scrum-Half	39	9.58%	19	9.31%	9	8.33%	11	11.58%
<i>Adjusted Standardised Residual</i>			-0.20		-0.50		0.80	
Fly-Half	24	5.90%	12	5.88%	6	5.56%	6	6.32%
<i>Adjusted Standardised Residual</i>			0.00		-0.20		0.20	
Centre	48	11.79%	31	15.20%	10	9.26%	7	7.37%
<i>Adjusted Standardised Residual</i>			2.10		-1.00		-1.50	
Wing	44	10.81%	23	11.27%	7	6.48%	14	14.74%
<i>Adjusted Standardised Residual</i>			0.30		-1.70		1.40	
Fullback	27	6.63%	15	7.35%	9	8.33%	3	3.16%
<i>Adjusted Standardised Residual</i>			0.60		0.80		-1.60	
Total	407	100.0%	204	100.0%	108	100.0%	95	100.0%

Table 6.5 Distribution of Academy Clubs between clusters and adjusted standardised residuals

Academy Club	Total N=	Proportion of sample (%)	Cluster 1		Cluster 2		Cluster 3	
			N=	Distribution (%)	N=	Distribution (%)	N=	Distribution (%)
Academy A	30	7%	12	5.88%	5	4.63%	13	13.68%
<i>Adjusted Standardised Residual</i>			-1.20		-1.30		2.70	
Academy B	29	7%	17	8.33%	8	7.41%	4	4.21%
<i>Adjusted Standardised Residual</i>			0.90		0.10		-1.30	
Academy C	32	8%	26	12.75%	1	0.93%	5	5.26%
<i>Adjusted Standardised Residual</i>			3.70		-3.10		-1.10	
Academy D	18	4%	9	4.41%	6	5.56%	3	3.16%
<i>Adjusted Standardised Residual</i>			0.00		0.70		-0.70	
Academy E	13	3%	1	0.49%	9	8.33%	3	3.16%
<i>Adjusted Standardised Residual</i>			-3.10		3.50		0.00	
Academy F	39	10%	21	10.29%	14	12.96%	4	4.21%
<i>Adjusted Standardised Residual</i>			0.50		1.40		-2.00	
Academy G	46	11%	22	10.78%	13	12.04%	11	11.58%
<i>Adjusted Standardised Residual</i>			-0.30		0.30		0.10	
Academy H	39	10%	17	8.33%	9	8.33%	13	13.68%
<i>Adjusted Standardised Residual</i>			-0.90		-0.50		1.60	
Academy I	28	7%	9	4.41%	12	11.11%	7	7.37%
<i>Adjusted Standardised Residual</i>			-2.00		2.00		0.20	
Academy J	28	7%	16	7.84%	6	5.56%	6	6.32%
<i>Adjusted Standardised Residual</i>			0.80		-0.60		-0.20	
Academy K	28	7%	14	6.86%	5	4.63%	9	9.47%
<i>Adjusted Standardised Residual</i>			0.00		-1.10		1.10	
Academy L	28	7%	16	7.84%	4	3.70%	8	8.42%
<i>Adjusted Standardised Residual</i>			0.80		-1.50		0.70	
Academy M	19	5%	8	3.92%	6	5.56%	5	5.26%
<i>Adjusted Standardised Residual</i>			-0.70		0.50		0.30	
Academy N	30	7%	16	7.84%	10	9.26%	4	4.21%
<i>Adjusted Standardised Residual</i>			0.40		0.90		-1.30	
Total	407	100%	204	100%	108	100%	95	100%

### 6.3.2.2 *Meso-level organisation*

Table 6.5 shows the distribution of players by Academy Clubs between the three clusters. Chi-squared analysis revealed a significant relationship between cluster and the academy which nominated them as an EAP ( $\chi^2(26) = 54.346, p < .001$ ). Whilst 11.9% of cells had expected counts below 5, the minimum expected count (3.03) satisfied the assumptions of the test. Although a small number of cells had observed counts as low as 1, the assumptions of the chi-square were still met, and the adjusted standardised residuals were used to interpret significant cell contributions (ASR  $> 1.96$ ). Examination of adjusted standardised residuals revealed several notable deviations. Players from Club C were significantly more likely to appear in Cluster 1 (3.70) and significantly less likely to progress via Cluster 2 (-3.10). In contrast, Club E (3.5) and Club I players (2.00) were overrepresented in Cluster 2, with both underrepresented in Cluster 1. Club A players (2.70) were disproportionately represented in Cluster 3, while Club F players (-2.00) were less likely to be found in Cluster 3. These findings indicate that whilst clubs were all represented in each cluster, developmental trajectories varied significantly across clubs, with some emphasising early identification, others relying on extended development, and some showing greater late-entry fast-tracking.

Considering the Premiership Club players debuted with between clusters, Pearson chi-squared result was significant ( $\chi^2(24) = 41.466, p = .015$ ). Table 6.6 shows the distribution of players by Premiership Clubs and cluster. Adjusted standardised residuals were examined to determine which cells contributed most to the association. Players from Club C were significantly overrepresented in Cluster 1 (3.00) and underrepresented in Cluster 2 (-2.10). Club I was significantly overrepresented in Cluster 2 (2.90), while conversely, Club A had a disproportionately high number of players in Cluster 3 (3.10). The chi-square test met all assumptions, with only 1 cell (2.6%) having an expected count less than 5, validating the robustness of the result.

Table 6.6 Distribution of Premiership Clubs between clusters and adjusted standardised residuals

Premiership Club	Total N=	Proportion of Sample (%)	Cluster 1		Cluster 2		Cluster 3	
			N=	Distribution (%)	N=	Distribution (%)	N=	Distribution (%)
Club A	36	8.85%	13	6.37%	7	6.48%	16	16.84%
<i>Adjusted Standardised Residual</i>			-1.80		-1.00		3.1	
Club B	28	6.88%	18	8.82%	6	5.56%	4	4.21%
<i>Adjusted Standardised Residual</i>			1.60		-0.60		-1.20	
Club C	30	7.37%	23	11.27%	3	2.78%	4	4.21%
<i>Adjusted Standardised Residual</i>			3.00		-2.10		-1.30	
Club D	21	5.16%	7	3.43%	10	9.26%	4	4.21%
<i>Adjusted Standardised Residual</i>			-1.60		2.20		-0.50	
Club F	38	9.34%	22	10.78%	11	10.19%	5	5.26%
<i>Adjusted Standardised Residual</i>			1.00		0.40		-1.60	
Club G	42	10.32%	23	11.27%	10	9.26%	9	9.47%
<i>Adjusted Standardised Residual</i>			0.60		-0.40		-1.60	
Club H	41	10.07%	16	7.84%	11	10.19%	14	14.74%
<i>Adjusted Standardised Residual</i>			-1.50		0.00		1.70	
Club I	28	6.88%	9	4.41%	14	12.96%	5	5.26%
<i>Adjusted Standardised Residual</i>			-2.00		2.90		-0.70	
Club J	30	7.37%	16	7.84%	7	6.48%	7	7.37%
<i>Adjusted Standardised Residual</i>			0.40		-0.40		0.00	
Club K	27	6.63%	12	5.88%	8	7.41%	7	7.37%
<i>Adjusted Standardised Residual</i>			-0.60		0.40		0.00	
Club L	32	7.86%	17	8.33%	6	5.56%	9	9.47%
<i>Adjusted Standardised Residual</i>			0.40		-1.00		0.30	
Club M	22	5.41%	11	5.39%	5	4.63%	6	6.32%
<i>Adjusted Standardised Residual</i>			0.00		-0.40		0.40	
Club N	32	7.86%	17	8.33%	10	9.26%	5	5.26%
<i>Adjusted Standardised Residual</i>			0.40		0.60		-1.10	
Total	407	100.00%	204	100%	108	100%	95	100%

Considering potential movements between Academy Club and Premiership Club, table 6.7 indicates the proportion of players who progressed within the same club organisation or who changed organisation between academy registration and Premiership debut. Chi-squared analysis was highly significant ( $\chi^2(2) = 39.796, p < .001$ ). Notably, players in Cluster 2 were significantly more likely to make their Premiership debut for a different club (36.1%, ASR = 4.70). In contrast,

Cluster 1 players overwhelmingly debuted for the same club (92.2%, ASR = 1.50), with those debuting in different clubs significantly underrepresented (7.84%, ASR = -3.20). Cluster 3 showed no significant deviation from expected distributions. To summarise, players who debuted at the same club they started with were significantly more likely to be in Cluster 1 or 3, while Cluster 2 has a notably higher proportion of players who changed clubs.

*Table 6.7 Proportion of players to progress from the academies to the Premiership within the same or different club organisations, with adjusted standardised residuals*

Academy Club match	Total N=	Proportion of Sample (%)	Cluster 1		Cluster 2		Cluster 3	
			N=	Distribution (%)	N=	Distribution (%)	N=	Distribution (%)
Same	337	82.80%	188	92.16%	69	63.89%	80	84.21%
<i>Adjusted Standardised Residual</i>			1.50		-2.20		0.20	
Different	70	17.20%	16	7.84%	39	36.11%	15	15.79%
<i>Adjusted Standardised Residual</i>			-3.20		4.70		-0.30	

### 6.3.2.3 Birth quartile

Table 6.7 shows the distribution of players by birth quartile and cluster. Chi-squared analysis found no significant association of birth quartile with cluster grouping ( $\chi^2(6) = 9.772, p = .135$ ). Although no individual adjusted standardised residual exceeded  $\pm 1.96$ , a pattern does emerge. In observing the number of players per birth quartile (Table 6.8), 30.96% of the sample are Q1 players, representing the relatively eldest players per selection year. Whereas Figure 6.8 indicates that whilst each BQ is skewed toward Cluster 1, as the birth quartiles progress the distribution becomes more equally spread. As such, a linear-by-linear association chi-square test was conducted to examine the relationship between birth quartile and development pathway cluster membership. The test revealed a statistically significant linear trend,  $\chi^2(1, N = 407) = 6.497, p = 0.011$ . This indicates that as birth quartile increases (i.e. players are born later in the year), the likelihood of being in Cluster 1 decreases, while membership in Cluster 3 increases.

*Table 6.8 Distribution of players by birth quartile and cluster with adjusted standardised residuals*

Quartile	Total N=	Proportion of Sample (%)	Cluster 1		Cluster 2		Cluster 3	
			N=	Distribution (%)	N=	Distribution (%)	N=	Distribution (%)
Q1	126	30.96%	70	34.31%	34	31.48%	22	30.96%
		<i>Adjusted Standardised Residual</i>	1.50		0.10		-1.90	
Q2	99	24.32%	51	25.00%	29	26.85%	19	24.32%
		<i>Adjusted Standardised Residual</i>	0.30		0.70		-1.10	
Q3	101	24.82%	50	24.51%	21	19.44%	30	24.82%
		<i>Adjusted Standardised Residual</i>	-0.10		-1.50		1.70	
Q4	81	19.90%	33	16.18%	24	22.22%	24	19.90%
		<i>Adjusted Standardised Residual</i>	-1.90		0.70		1.50	
Total	407	100%	204	100%	108	100%	95	100%

## 6.4 Discussion

The aims of this chapter were to a) utilise unsupervised cluster analysis to explore patterns of player progression through the male English rugby union talent system which result in the Premiership; and b) consider potential differences in relative age, playing position, academy, and Premiership club between player journey types. Hierarchical and K-means clustering were implemented to group player's journeys through the talent system, with Pearsons chi-squared analysis exploring associations between clusters and players' position, birth quartile, academy and Premiership club.

### 6.4.1 Player journey archetypes

Unsupervised cluster analysis of player journeys revealed three progression archetypes: Hares, Tortoises, and Falcons. Hares (Cluster 1 players), had the highest average count of Junior Academy EAP seasons ( $1.98 \pm 0.83$ ), suggesting they were nominated EAP the earliest of all archetypes. The average count suggests these players, on average, were nominated during the U17 season, which aligns with the findings of Chapter 3 (see Table 3.3). With the count of Junior Academy EAP suggesting the average Hare was a J-EAP, considering the results of Chapter 3, it is thus unsurprising these players accounted for >50% of this study sample. This data also means that the

Total Time is split between junior and senior academy, thus despite having a moderate total time in comparison to Falcons, Hares progress quickly to the Premiership.

The counts presented in Table 6.2 infer that Falcons (Cluster 3) were all nominated EAP in the senior academy, thus Falcons represent S-EAP players (Chapter 3). This cluster was typified by the lack of junior academy data. Whilst I have not considered whether these players were PDG players or were late entrants into the talent system, once nominated EAP they had the overall fastest progression to the Premiership of any cluster. However, as previously noted, in the case of this cluster, Total Time only considers senior career whilst Clusters 1 and 2 encompass junior and senior career.

Tortoises (Cluster 2) on average had the slowest progression to the Premiership (>5 years average), with substantially greater involvement in lower league competitions prior to Premiership debut. Specifically, Championship seasons had a substantially higher count compared to other clusters. Tortoises, as such, had a longer progression to the Premiership, detouring via the lower leagues. Whilst it is beyond scope of this current study, considered alongside that Tortoises had the lowest percentage of Same Club progression (63.9%), these players may have been deselected from their academy and found an alternate route through the talent system. This may go towards explaining the high count of Championship seasons. This raises some important considerations for the design of the talent system, and the need for a talent system to facilitate multiple entry and exit points.

The stated intention of the talent system was to be ‘wide and emergent’ at earlier stages, prior to becoming ‘narrow and focused’ (Till et al., 2020). These results suggest there are three main routes through the talent system from initial EAP nomination to Premiership debut. With different archetypes having different temporal and structural features, results suggest the talent system is capable of supporting an array of progression types. This study also supports the findings of

Chapter 3, players whose potential was not recognised early in the junior academy were able to progress to the Premiership. Therefore, these findings suggest that the normative pathways of players represented in both a narrowness for those in the Hare cluster and a width for Tortoises and Falcons. However, most Premiership players graduating from the academy system were identified earlier and would seem to on average have a relatively straight-forward progression to the Premiership.

#### **6.4.2 Position**

Whilst position category (Forwards and Backs) did not have a significant interaction with clusters, playing positions did. In research and practice, players are often divided between Forwards and Backs (e.g., Dimundo, Cole, Blagrove, McAuley, Till, Hall, et al., 2021; Dimundo, Cole, Blagrove, McAuley, Till, & Kelly, 2021). This current study supports calls for greater nuance when considering how specific positions develop beyond broad positional classifications (Owen et al., 2022).

The most prevalent position in the sample were back row players, accounting for 19.16% of the sample, whereas the least common position was fly-halves (5.90%). However, although not statistically considered, these differences are likely due to the composition of the match-day squad, whereby in the starting 15 players there are three times as many back row players as there are fly-halves (Table 6.1). Considering Table 6.4, all positions where there is only one member per starting 15 (hooker, scrum-half, fly-half, and fullback) all accounted for a smaller proportion of the overall sample.

This study observed that players in back row and centre positions were more likely to be Hares, with progression typified by Cluster 1. This may suggest that on average, these positions were more

likely to be nominated EAP early in the junior academy and progress to the Premiership quickly. Wing and prop playing positions were more likely to be ‘Falcons’, falling in Cluster 3 to a greater extent, whereas hookers were more likely to be ‘Tortoises’, likely having a longer Total Time between initial EAP nomination and Premiership debut as per Cluster 2. Whilst, it is beyond scope of this study to ascertain why different positions had differential progression archetypes, there are several factors which may influence this. For example, it well documented the differences in the game demands between junior and senior rugby union (e.g., Cunningham et al., 2016). As such, some positions may take longer to develop and achieve a Premiership debut after earning a senior contract. Otherwise, differences between positions in the type of progression they experience may be reflective of what anthropometric and physical characteristics are valued during development and selection (e.g., Owen et al., 2022, 2022).

The specialisation of the position may influence how early a player may gain a debut. For example, props require a very specific morphology, with Fontana et al. (2015) observing international and top-flight domestic props to have higher total body mass and fat mass compared with all other positions. Props also have a highly specific and high-attrition role within the squad, due to involvement in the front row of the scrum, lifting other players in lineouts, and are highly involved in tackles. These factors may mean there are few players who can play effectively as a prop, and with the high-attrition, may be more turn-over of props between match-day squads, which may lead to quicker Premiership debut. This would present an interesting opportunity for future research to consider the interaction between position specificity, player characteristics, and junior-senior transition. Reflecting back to the results of Chapter 4 where practitioners perceived positions to have differential progression trends, this study goes towards quantifying these trends and may challenge some of the practitioner assumptions. This further highlights the need for data informed approaches in TD.

### **6.4.3 Meso-level organisation**

Results of this study observed a significant interaction between both Academy Club and Premiership Club with clusters. This indicates that academies may be more prone to sending players down specific progression pathways, and Premiership clubs may be more prone to select players who experienced a type of progression. Overall, results suggest that the majority of players, be they Hares, Tortoises or Falcons, progressed to play in the Premiership for the same club who developed them, as such are homegrown players. However, as previously highlighted, Hares were the most likely group of players to experience this progression and Tortoises the least likely (92.2% and 63.9% same club progression respectively).

Considering specific organisations, Academy Club C players were significantly more likely to be Hares and significantly less likely to be Tortoises, whereas Academy Club A players were more likely to be Falcons, and Academy Club E players significantly unlikely to be Hares but significantly more likely to be Tortoises. These results may therefore reflect contextual nuances such as specific organisation approaches to TD, EAP nomination strategies, and progression opportunities. These finding highlights the high variability in the English rugby union talent system and underscores that talent systems cannot be considered homogenous. Whilst Chapter 3 observed differences in the efficiencies and effectiveness of the 14 academies based upon the outcomes of TD, this study builds upon those results to indicate that the process of TD may also vary between academy TDEs.

Considering where players debuted adds nuance to the results, observing that Premiership Club had a significant interaction with clusters. Whilst many Premiership Club organisation results reflected those of their Academy Club counterpart, it is interesting where there are differences. For example, whilst Academy Club D has no significant skew between clusters, Premiership Club D

(representing the senior component of the same organisation) had a greater abundance of Tortoises (i.e., Cluster 2 players). This may represent an integration challenge within the organisation. Overall, these findings suggest that Premiership clubs may have a preference to contracting and selecting players who experienced a certain development trajectory, implying differential selection and recruitment preferences.

Whilst the majority of the sample progressed to the Premiership within the same organisational structure as their original Academy Club, it is notable that 17.2% of players transitioned between organisations to progress, with the majority of them seeming to be Tortoises. This is notable because the sample consists of the players who were all nominated EAPs, with Academy Club assigned to the organisation who initially nominated them. As previously discussed, EAPs are players who were identified to be high-potential and received greater resourcing from the nominating academy. As such, these players may represent a disconnect between what the academy's identification of high-potential talent and the criteria valued by the senior club organisation. As discussed in Chapter 3, EAP nomination is based upon perceived potential. It may be that these players potential was not realised on time with the expectations of the organisation, meaning they had to find an alternative route to progress.

Whilst it is beyond scope of this study to consider why players needed to transition to progress, reflecting on talent being a social construct (John & Thiel, 2022), this finding may reflect that different club organisations have different perspectives of talent based upon the preferences and performance needs of the Premiership club organisation. As such, whilst a player may not be considered talented by one organisation, they may be considered talented by another. Otherwise, whilst it was not considered in this current study, certain academies may be prone to developing more players of a specific position than they can accommodate in the senior academy or are needed

in comparison to the wider senior squad. As such, these players may need to transition to other Premiership clubs to continue development.

Promotion and relegation were features of the Premiership league up until 2020/21. Whilst this study did not consider the movement of clubs between leagues this may be a factor that has shaped the results. Cluster 2 is typified by a longer progression from initial EAP registration to the Premiership and has a substantially higher count of Championship seasons in particular. As such, Tortoises may represent some players registered in clubs who were promoted from Championship league to the Premiership. Anderson and Miller (2011), in comparing the number of homegrown players developed across English Premier League soccer, distinguished between clubs who were ‘ever-present’ in the league and those which were prone to fluctuating between leagues. Although not statistically tested, findings suggested that players developed by ever-present Premier League clubs may be less likely to transfer to other club organisations early in their career. As such, future research may wish to take promotion and relegation into account as factors which influence processes of TD as well as outcomes.

#### ***6.4.4 Birth quartile***

Previous research of relative age in English rugby union observed relatively younger players (BQ4) were nearly four times more likely to reach the senior professional and international playing level compared to BQ1 and BQ2 quartile players, despite being proportionately underrepresented in the talent system (Kelly, Till, et al., 2021). Explanations of why relative age effects and reversal occur has centred around the micro-level of the talent system, considering the player’s development experience and responses to challenge, such as the underdog hypothesis (Kelly et al., 2020) and the rocky road (McCarthy et al., 2022). Whilst this study did not include players who did not reach the

Premiership, and thus cannot consider potential reversal of advantage, the results indicate relative age may influence how a player navigates the structure of the talent system.

Whilst there was not a significant association between birth quartiles and clusters, the linear-by-linear analysis suggested a trend where players born later in the selection year were progressively less likely to feature in Cluster 1. Cluster 1 was typified by players who on average were nominated EAP early in the junior academy and who progressed to the Premiership without spending time in the lower leagues. Whilst results can not directly infer a potential interaction between timing of EAP nomination and players' relative age, future research may wish to take this into consideration. Other research into English rugby union academy players observed trends between relative age and physical characteristics, with relatively older players possessing enhanced anthropometric, muscular power, muscular strength, speed and momentum qualities (Owen et al., 2022). As such, it is likely that an interaction of factors influences how a player progresses through the talent system.

## **6.5 Limitations**

There are several limitations to be noted with this current study. This study only considered progression up until players' Premiership debut appearance. A debut appearance may still be considered as a development opportunity and stage within itself; some clubs may have differential strategies of how to integrate senior academy players into Premiership squads which may account for the significant interaction between Premiership Club and clusters. Future research may wish to consider how coaches may influence the junior-senior transition and integrate developing players into performance teams. Otherwise, by only considering debut appearance, I have not considered whether players proceeded to feature in multiple Premiership matches. As such, future research

should also consider all player development events up until the player becomes an established player and consider the relative success of their Premiership career (e.g., Anderson & Miller, 2011).

This study did not consider potential gaps in players' careers. Whilst outlying players with exceeding Total Time were removed from the sample, due to the lack of data beyond the English talent system and competition structures, it is possible some players journey included stages not captured by the data. The development stages included in this study were inherently limited to the data available in the project dataset. As such, it was not possible to capture routes prior or concurrent to becoming an EAP (e.g., University rugby), or other routes to the Premiership (e.g., other national domestic leagues). Neither could the full journey within the talent system be considered due to a lack of access to DPP registration lists, and the poor data availability of PDG necessitating its exclusion. Otherwise, the missing school data in EAP registration lists meant this study could not consider how a player's school type (independent or state) may impact pathway progression.

This study did not take into consideration the combination of factors influencing development (e.g., BQ1 Props). With a larger sample size, a future study could potentially consider a more granular consideration of these factors. Although beyond scope of this study, by only considering players who successfully transitioned to the Premiership, how each of the considered factors (position, club, relative age) may influence non-successful pathways could not be considered. Otherwise, the Premiership is not static; teams have historically been subjected to promotion and relegation. This study was unable to take this into account but raises an important question for future research how the relative standing and security of a team within a league may influence the opportunities afforded to developing players.

This study employed an exploratory analytical approach to examine player development pathways, which whilst offering novel insights presents several methodological limitations. The cluster analysis was dependent on the selected input variables and the standardisation approach (Z-scores), meaning that alternative variable combinations or scaling methods could produce different clustering solutions. Furthermore, the use of hierarchical and K-Means clustering assumes linear separability and may oversimplify the complexity and non-linearity inherent in talent development trajectories. Cluster solutions were derived using methods available in SPSS, which lacks some advanced validation procedures. Future studies should consider using more rigorous validation frameworks, possibly via dedicated statistical software or programming environments such as R or Python.

## **6.6 Conclusion**

Through implementing cluster analysis and chi-squared analyses, this study observed three main player journey archetypes which resulted in a Premiership debut: Hares, Tortoises, and Falcons. This has important connotations for the talent system design and how players can be best supported throughout their development. This study also highlights the importance of considering how player characteristics influence their pathway to senior elite sport, and to move beyond just focusing on *if* they reach that level. In this study, playing position and club organisation held significant interactions with the three journey archetypes, suggesting a player's specific position and who develops them significantly shapes their development. The significant interaction between clusters and Premiership club suggests differential recruitment and selection strategies between organisations. Whilst relative age was not found to have a significant interaction with player journey archetypes, the likelihood of featuring in 'early identified and direct progression' archetype was reduced as BQ increased. Overall, this study strengthens the notion that talent systems cannot be considered as homogenous, and that there are multiple ways a player may navigate the talent system.

## **Chapter 7: Discussion, Practical Implications and Future Directions**

### **7.1 Overview of the thesis**

To the best of my knowledge, this thesis represents one of the most comprehensive, multi-dimensional investigations of a single talent system to date. The overarching aim of this thesis was to consider factors influencing the efficiency and effectiveness of the English rugby union talent system and systemic factors influencing the development of Premiership rugby players. The purpose of this was to inform strategic decision making and resource allocation. Through four interconnected studies employing a pragmatic mixed-methods approach, this work has generated actionable insights that challenge prevailing assumptions about TD, whilst providing evidence-informed recommendations for policy and practice.

This thesis was designed to examine the English rugby union talent system at multiple levels simultaneously. Chapter 3 presented a ten-year retrospective analysis of the talent system, considering efficiency via the proportion of athletes to progress from the academies into the English Premiership. By incorporating the EAP registration lists, the chapter was able to consider a nuanced analysis of which players were progressing and from which academies, demonstrating the influence of high-potential status on progression, and the effectiveness of the EAP policy. Overall, players who were nominated as an EAP in the junior academy accounted for the majority of Premiership debuts, and for every season earlier a player was nominated EAP their odds of a Premiership debut increased 2.6 times. However, when delimitating to players who progressed to the senior academy, players who were first nominated in the senior academy (S-EAPs) had a higher relative conversion rate and had slightly higher odds of a Premiership debut. Comparing EAP progression between the junior academies (meso-level) and the overall trend (macro-level) revealed considerable variability in the relative efficiency and effectiveness within the talent system. This initial empirical chapter

highlighted several areas for future research, some of which were able to be addressed in the subsequent thesis chapters.

Reflecting the meso-level variability highlighted in Chapter 3, and that a purely quantitative evaluation of the talent system will not adequately inform practice, Chapter 4 presented a qualitative study utilising focus groups aiming to explore and understand factors influencing academy efficiency and effectiveness. Focus group discussions were held with each individual academy, with the results of Chapter 3 and preliminary results of Chapter 5 presented. Following analysis of focus group contents, academy managers were invited to participate in member reflections, which were integrated into the analysis. Four themes were generated via RTA, including the role of other TDEs beside the academies, the influence of system rules and regulations, the organisational structure and integration of the academy and Premiership clubs, and the perceived influence of resources. The findings of this chapter suggests that there is inherent variability in the talent system, and that meso-level context is an important factor in TD. This study also highlighted perceptions that specifically schools and the relative talent pool of each academy TDE is perceived to be important factors influencing their effectiveness.

Whilst Chapter 3 demonstrated variability between the efficiency and effectiveness of academy TDEs, Chapter 4 highlighted how resources may shape practice. With the data available to this project, there was opportunity to explore the potential associations between academy financial and human resources with efficiency and effectiveness. This study found that there was non-significant variability in the cost to develop Premiership players between academies, with results indicating that the financial resources available to each academy may not directly influence TD outcomes. Reflecting the results of Chapter 4 and the perceived impact of the academy boundary, specifically the influence of high-performing rugby schools and the talent pool within the academy boundary,

there was opportunity to statistically consider potential associations. Analysis considered the distribution of high-performing rugby schools between academy boundaries, and the talent pool within the boundaries. Results indicated that the academy boundaries may have limited direct influence on the efficiency and effectiveness of academies. Whilst this study does not claim causation, it challenges the practitioner perceptions reported in Chapter 4.

Finally, reflecting that Chapter 3 focused on the outcomes of the talent system and not the process, Chapter 6 presented an exploratory study considering the variations in the player pathways from academy to Premiership, and how relative age, playing position, and academy affiliation may shape progression. Players journeys from the academy to the Premiership were plotted, considering inclusion in EAP registration lists and match appearances in National League and RFU Championship fixtures. Cluster analysis grouped player journeys into three main archetypes. Analysis of the cluster characteristics revealed structural and temporal differences between player journey archetypes. As such, players could be typified as ‘Hares’ (EAP nominated early in junior academy, fast progression), ‘Tortoises’ (slow progression, non-direct route), and ‘Falcons’ (EAP nominated post-junior academy, fast progression). Results indicate that playing position, academy and Premiership club all had significant interactions with clusters, as such may influence the type of progression they experience. However, ‘forward’ and ‘back’ broad position categorisations and birth quartile chi-squared analyses did not reveal significant interactions. However, post-hoc analysis indicated a player’s odds of being a Hare decreased the further a player’s birth month fell from selection cut-off dates. Results of this study highlight that there are multiple player pathways from the academies which result in the Premiership and highlight the need for future research to consider how factors influence how an individual progresses, not just if they progress. Acknowledging the different routes through the talent system may enable macro and meso organisations to provide greater and more specialised support to developing players.

A significant strength of the thesis is that it represents one of the first truly multidimensional investigations of a whole talent system, benefiting from access to a large-scale dataset, which enabled multiple forms of analysis. Chapters 3, 5 and 6 utilised this data to explore factors influencing progression across the entire talent system. However, Chapter 4 highlights the importance and necessity of a mixed-methods approach in contextualising and exploring quantitative findings. Through this range of studies, I have comprehensively investigated the talent system and generated research capable of informing practice. The findings of these studies reveal TD as a complex system where macro-level policies interact with meso-level contexts to produce highly variable outcomes at the micro-level. This systems level understanding represents a significant advance over previous research that has typically examined talent development levels in isolation.

## **7.2 Contribution to the literature**

This thesis has several novel findings and implications for the broader TD literature. In this section I discuss several areas this thesis has contributed to the broader TD literature, specifically in regard to beliefs about talent, the non-homogeneity of talent systems, resources in TD, and the organisational structure of talent systems.

### ***7.2.1 Beliefs about talent matter***

‘Beliefs about talent matter’ is one of Baker and colleagues’ (2018, p.50) propositions of talent. This proposition suggests that attitudes and perceptions of talent influence individuals’ motivations, behaviours, and actions (Baker et al., 2018). From the practitioners’ perspective, their perceptions impact how they approach talent identification and development, whereas from the athletes’ perspective this may influence how they respond to challenge in their development pathway (Wattie & Baker, 2017). This thesis has demonstrated that beliefs about talent influence

processes and the outcomes of TD. Chapter 3's findings illustrate that practitioner's beliefs of a player's potential, coupled with the additional resources, may significantly impact the likelihood of that player reaching the elite level. Whilst this study cannot separate the likely compounding factors encompassed in EAP nomination (e.g., expectancy effects, Matthew effects, increased resourcing), the EAP nomination is a direct result of practitioner's perception of an athlete's potential. Chapter 6 on the other hand suggests that when an athlete is deemed high-potential may shape how they navigate a talent system and progress to the senior elite level.

Labels conveying perceptions of potential are important considerations if beliefs about talent matter as they may be able to shape how other practitioners and athlete peers perceive talent. Whilst to the best of my knowledge research has not considered labels in sport contexts, Baker (2022) highlighted labels may influence the actions of the labelled athlete, as well as those of their peers and their coaches. Expectancy theory would suggest that expectations of athletes implicitly influences coaches actions (Rosenthal & Jacobson, 1968; Solomon, 2008; Solomon, 2010). Whereas in education contexts, 'giftedness' labels influence teacher-pupil interactions (Klimecká, 2024). In this sense, a talent label serves as an explicit and efficient means of conveying perceptions of potential and expectations associated with the label. Given the significant role of concurrent environments as discussed in Chapter 4, there is potential for labels to create a ripple effect throughout the labelled and non-labelled athletes' development. In this sense, the beliefs about talent of academy practitioners may impact the interactions between a player with their peers and coaches across their all their TDEs, potentially amplifying the initial belief. Considering Matthew Effects, EAP status, which gives conferred players an advantage within the academy TDE, may also present additional advantages across their TD network. When considering differences between EAP conversion rates of the academy TDEs presented in Chapter 3, and the differences in cluster distribution between organisations in Chapter 6, indicate there may be different nomination

strategies. This showcases how perceptions of talent may differ across a talent system, and when considering the findings of Chapter 4, it may go toward how beliefs of talent may be shaped by context (cf. John & Thiel, 2022).

### ***7.2.2 Non-homogeneity of talent systems***

This thesis has consistently demonstrated considerable variability within the English rugby union talent system, with important connotations for theory and practice. Chapter 3 revealed substantial variability between the relative efficiencies and effectiveness of the fourteen academy TDEs. Chapter 4 demonstrated standardised talent system policies were differentially perceived and experienced based on interaction with academy specific context. Chapter 6 results indicated that academy organisations may be more likely to develop players who follow a particular pathway through the talent system, and Premiership clubs may be more likely to select players who experienced a certain type of progression. Whereas Chapter 5 demonstrated that despite there being variability in the resources available to an academy, these differences did not necessarily influence Premiership player development.

As such, this thesis has comprehensively demonstrated that talent systems cannot be considered to be homogenous, and the observations of one TDE cannot necessarily be extrapolated and applied to all TDEs within the same macro context. Whilst previous research has emphasised that elements of successful macro talent systems cannot be directly transferred between contexts (Cahill & MacNamara, 2023), results from this thesis highlight that the practices of meso-level organisations may also not be directly transferable within and between contexts. In essence, this thesis has showcased the need to account for the contextual variation *within* talent systems. As such, this raises important considerations for how talent systems and individual TDEs may be evaluated. I

would suggest that evaluations of talent systems and policies must account for differences between meso-level organisations and move toward more multi-dimensional evaluations.

### ***7.2.3 Resources in talent development***

An aim of this thesis was to inform the efficient and effective use of resources in English rugby union TD. Despite the likely importance of resources in TD, as demonstrated at the macro-level (De Bosscher et al., 2009; Truyens et al., 2014, 2016), it was surprising that there is limited research focused on resources of the meso-level. As such, a novel feature of this thesis is considering TD to be a resource challenge. As discussed in Chapter 2, talent identification and selection may be used as tools to manage resource, with practitioners discussing in Chapter 4 how resources influence selection decision making. Chapter 5 explicitly explored associations between TDE effectiveness and resource availability. Whilst causation could not be inferred, results of this study indicate that total resource availability may not directly influence the outcomes of TD, instead the strategic use of resources may be more important. This may be supported by the results of Chapter 4, whereby academy practitioners made decisions to cope with a perceived lack of resource, such as *when* they chose to invest in high-potential players (as demonstrated in Chapter 3).

This thesis has also considered talent system design as a resource challenge. Increasingly there are recommendations to move towards talent system designs which foster ‘as many as possible for as long as possible’ (Erikstad et al., 2021). This thesis has demonstrated the practical difficulties in achieving such a design. As described in Chapter 4, macro-level policies aimed to keep cohorts large by mandating academies must contribute to the development of 10% of the academy boundary U14-U16 playing population and must field at least two academy teams for U16 and U17 competitions. However, Chapter 4 demonstrated that what seems possible (or mandated) at the macro-level was not always feasible at the meso-level. Each academy must operate within its

resource constraints, meaning some struggled to meet these quotas without straining quality of provision. However, such regulations encouraging large athlete cohorts were necessary to prevent inappropriately early deselection. As Chapter 3 highlights, academies were not reliably able to predict which athletes would progress, and Chapter 4 demonstrates academies would not necessarily engage with larger cohort sizes without regulation. As such, resources may shape ‘what is possible’, but also ‘what is possible’ may be shaped by the degree to which TDEs are prepared to compensate ‘best practice’. In this sense, this thesis reveals a nuanced reality; having more resources does not automatically yield more success (Chapter 5), but how and when resources are allocated (chapters 3, 4 and 6) can substantially differ between academies. In practice, resources inevitably shape what actions are taken and which trade-offs are made, meaning TD involves constant balancing of limited resources against maintaining ‘good enough’ practice.

#### ***7.2.4 Talent system structure and organisations***

In highlighting the non-homogeneity of the talent system, this thesis has highlighted the importance of the organisations operating in the talent system. The structure and design of the talent system and the interactions within meso-level organisations influenced player development. In this sense, whilst research has often focused on the micro-level interactions between coaches and athletes, the specific attributes of athletes which influence progression, or the adaptive features of TDEs which promote development, this thesis demonstrates that the interaction between micro, meso, and macro levels influence development.

Insight from this thesis holds theoretical relevance for understanding the role of the TDE. Previous research has highlighted several features of effective TDEs (Henriksen et al., 2010a, 2011; Martindale et al., 2007), however as this thesis has indicated, we need to consider how the operations and practices of the TDE are shaped by context (Gavin et al., 2024). Specifically, the design and

management of the talent system in which they operate. In this sense, we need a greater appreciation of the interaction between macro and meso levels of the talent system and how this interaction shapes the micro-level.

Specifically, this thesis has identified a significant gap in research concerning the role of concurrent environments in athlete development. Whilst Henriksen and colleague's (2010a) ATDE highlights the necessity of considering the athlete's broader context, the various stakeholders can not necessarily be conceptualised as extensions of the same TDE across contexts. As demonstrated by Chapter 4, it was inadequate to only consider the role of the academy TDEs in developing rugby union players at both the junior and senior academy levels. Whilst Chapter 5 indicated that schools did not impact the effective outcomes of the academies, the narrative presented in Chapter 4 indicates that schools may have a significant influence on the developmental experience of players. As such, whilst distinct TDEs, there is a need to consider inter-organisational relationships at the meso-level to understand how concurrent environments may best provide a coherent development experience.

### ***7.2.5 Methodological innovation in talent development research***

This thesis makes several significant methodological contributions that advance TD research beyond traditional single-study, single-level approaches. The multi-level systems analysis demonstrated represents a novel approach to comprehensive talent system investigation, that simultaneously examines macro, meso, and micro levels of operation. This methodological framework reveals system dynamics that remain invisible when examining single levels in isolation, providing a template that can be applied to other talent systems and sporting contexts. The approach addresses a critical gap in TD research, which has typically on isolated components rather than system-wide interactions.

The sequential integration of quantitative pattern identification, qualitative exploration, and subsequent quantitative validation represents an important advancement in mixed-methods approaches for policy-relevant research. This enables system-wide understanding and contextual explanation, making research findings significantly more actionable for policy makers who must balance the findings with the realities of implementation. The approach demonstrates how quantitative findings can inform qualitative inquiry, which in turn can guide targeted quantitative analysis, creating a robust and rich evidence base that addresses ‘what’ and ‘why’ questions (Gillespie et al., 2024), essential for effective policy development.

The thesis also demonstrates how organisation administrative data can be leveraged for sophisticated talent development research, developing methods for data integration and analysis that provide a practical template for other researchers working with similar datasets. Given the increasing availability of administrative data in sport organisations, these methodological contributions have significant implications for expanding the scope and scale of TD research with routinely collected data. Additionally, reflecting recent advancements in data analyses, this thesis expands upon research implementing machine learning techniques in TD contexts (Kelly, Williams, et al., 2022; Owen et al., 2022). Cluster analysis, as used in Chapter 6, enables advanced pattern recognition impossible through traditional analytical methods. This approach opens new possibilities for understanding the complexity and diversity of TD pathways within a talent system, moving beyond simplistic linear models. These methodological innovations collectively represent a significant advancement in how TD systems can be studied and understood, providing researchers with sophisticated tools for generating policy relevant insights in complex organisational contexts.

Many sports adopt multi-organisation meso level talent system designs, such as the academy structure of English Premier League soccer, the county system in English and Welsh cricket, and

regional centres in English hockey. However, similar limitations to those identified in the rugby union literature in Chapter 2 are evident in these other sports. For example, in cricket, Brown et al. (2023) via systematic review observed the majority of research has focused on micro level factors with limited research of the meso level. Even in substantially researched sports such as soccer which has greater research focus on micro (Altmann et al., 2024; Dugdale et al., 2021; Kelly et al., 2023), meso (Aalberg & Sæther, 2016; Gangsø et al., 2021; Larsen et al., 2013), and macro levels (Amenta et al., 2012; Bullough & Jordan, 2017; Ghio et al., 2019; Holt, 2002), with some consideration of the interaction between levels (Ashford et al., 2020; Gagnås & Thue Bjørndal, 2025), there is a lack of systems-level analyses and appreciation of contextual factors. TD research in other sports may benefit from systems-level research approaches that consider the contextual nuances within the system and the influence of external concurrent environments on system efficiency and effectiveness. As such, the research design of this thesis provides a potential template for system-level enquiries in other sports.

### **7.3 Implications for policy and practice in English rugby union**

Based on the above findings, several practical implications emerge for TD policy and practice in English rugby union, particularly around the data practices of the macro and meso organisations, and the design of the talent system. This next section aims to review the application of this research to practice and makes several practical recommendations.

#### ***7.3.1 Data informed approaches***

Throughout this thesis, several persistent narratives influencing practitioners' beliefs about TD have been challenged. As demonstrated in Chapter 4, conceptualisations that rugby union is a 'late development' or 'late maturation' sport has seemingly contributed to how resources are distributed between players and age-grades. As discussed in Chapter 1, this narrative seems to be a

misinterpretation of the Royal Society's consensus statement, which has led to academy practitioners perceiving there is little value in investing in a player's development until later in their pathway. However, in this context the junior academy consists of three age grades (U16, U17, U18), as such academies have limited time to develop a player towards senior contract. Combined with the lack of opportunities for players to be developed post-U18, investing in players 'early' (i.e., U16) or 'late' (U18) may make a significant difference to their development. As Chapter 3 demonstrated, the earlier a player was individually supported through EAP nomination, the higher odds they have of progressing to the senior elite level. As such, this thesis challenges this prevailing narrative. English rugby union cannot simply be conceptualised as a 'late development' sport because by doing so overlooks the patterns of apparent selection and the stage at which players appear to demonstrate future potential, and the potential benefit conferred by earlier support. As such, this thesis provides a data informed approach that challenges practitioners' perspectives. Reflecting on how the language used in TD may influence perceptions of talent (Grainger et al., 2024; Johnston et al., 2023), and how beliefs of talent matter (Baker et al., 2018), a systemic and conscious shift in language to refer to rugby union as a 'late final selection' sport may hold merit. This conceptualisation more accurately conveys what has been observed in this thesis, is more reflective of the 'wide and emergent' structure of the talent system (Till et al., 2020), and may help counter the perception that investing in players earlier offers limited value whilst also maintaining support for players who take longer to demonstrate their potential.

The influence of rugby playing schools in the English rugby union context has also been challenged by this thesis. As introduced in Chapter 1 and demonstrated in Chapter 4, there were strongly held perceptions that the quality of schools within the academy boundaries influenced the effectiveness of the academies. Whilst the quality of players' developmental experience is beyond the scope of this thesis, the research presented in Chapter 5 indicates the distribution of high-performing rugby

schools across academy boundaries has little bearing on the number of Premiership players developed by the academies, nor the number of subsequent Premiership appearances. Further, perceptions of the academy boundary influencing effectiveness by constraining the talent pool available to the academy was also challenged by Chapter 5. Reflecting back to beliefs about talent mattering (Baker et al., 2018), practitioners perspectives of the capacity of their academy to be effective based upon necessary constraints may implicitly influence their actions. As such, this thesis demonstrates the need for data informed practices.

The results of this thesis demonstrate the importance of a data informed approach, however this hinges on having access to the right data which is purposely collected. Prior to any analysis, substantial time was spent cleaning and organising the archival data shared by PRL. Whilst the data collection forms used by the academies were standardised, how each academy inputted data was not. There was substantial variation within each academy between seasons, and substantial variation between academies making synthesis challenging. Prior to PRL anonymising the data, issues were reported that even basic information (such as player names), were inputted differently between seasons. This combined with the generally poor data availability and omitted information (as reported in Chapter 1) caused delays and constrained analyses. Based upon this, several recommendations were made to PRL and RFU to implement more robust data collection methods so that the dataset produced by this PhD project can be built upon, but also to encourage data collection to include information which informs TD practice in future analyses.

### ***7.3.2 Talent system design***

This thesis has highlighted the interdependence between the macro and meso levels of the talent system. Evaluating the effectiveness and efficiency of the system requires an appreciation of the variability that exists within the meso-level. Conversely, evaluating the meso-level in isolation is

incomplete without considering the broader macro-level context. An example of this is highlighted by Chapter 3 with the EAP policy. Considering the conversion rates of the entire talent system, EAPs (and specifically J-EAPs) had the greatest conversion rate and odds of becoming a Premiership player. In this sense, considering the whole talent system, the EAP policy is effective. However, this chapter also highlighted substantial differences of the effectiveness of EAP policy between the academies (as shown by differences to net contribution), meaning the effective application of the EAP policy is not uniform.

The importance of considering the specific contexts of the academies was made evident in Chapter 4, where uniform expectations of provision were constrained by academy specific context, leading to unintended and potentially maladaptive consequences. However, without certain rules and regulations (such as limiting selection to the academy boundary, or minimum academy competition quotas), there is risk academies may divert to practices misaligned with the intended goals of the talent system and that are counterproductive to effective TD. As such, it is the challenge of PRL and RFU to balance the benefits of centralised regulation, which helps to promote adaptive features of talent development across the system, with the need to account for variability among academies and clubs. As discussed in Chapter 4, this may require granting academies greater autonomy to adapt to their specific contexts. However, increased autonomy would necessitate stronger accountability measures via the academy audit and would require greater support and guidance provided to the academies to inform contextually effective practices.

Chapters 4 and 5 investigated how contextual factors and resource availability influenced the effectiveness and efficiency of the academy system. Chapter 4 highlighted that while academy boundaries offered adaptive benefits, such as promoting development and discouraging player ‘poaching’, practitioners perceived these boundaries as constraining their ability to develop players.

However, the quantitative findings in Chapter 5 challenged this perception, demonstrating that features of the academy boundaries (e.g., population size, talent pool size, number of high-performing schools) did not appear to meaningfully influence academy outcomes. These insights were important in supporting discussions within PRL and RFU regarding the feasibility of revising boundary structures as part of the next Professional Game Plan cycle. Whilst this thesis did not make specific recommendations concerning boundary reform, the evidence generated contributed to the broader strategic considerations surrounding the proposed transition from fourteen to eleven academies.

This thesis has demonstrated that the current design of the talent system supports players with a range of development rates (chapters 3 and 6). For example, Chapter 3 highlighted players who were considered to have high-potential early progressed, as did players perceived to have high-potential comparatively late, whereas Chapter 6 highlighted temporal differences distinguished the different player journey archetypes with both ‘slow’ and ‘fast’ pathways. However, Chapter 3 also highlighted the steep selection process between junior and senior academy, meaning opportunity for non ‘on-time’ developers is greatly limited post-U18. From a resource perspective, it is necessary to draw a clear line for selection at a certain point. Nevertheless, this approach carries the risk of overlooking players whose potential may only emerge post-U18 and juxtaposes the common narrative of rugby union as a ‘late selection’ sport if there is little opportunity for late developers within the talent system. It may be advisable to implement a method of tracking players released from the academy post-U18 to monitor their development in alternative environments, such as universities and lower leagues.

Otherwise, as discussed in Chapter 4, the steep selection process between junior and senior academy appears to be partly driven by a lack of incentive to retain larger numbers of senior

academy players. Due to a lack of specific development competitions or support for senior academy players beyond international age-grade, limited senior academy contracts were offered and increased the jeopardy of non-selection from the junior academy. With the high ratio of junior players compared to senior academy quotas, this creates a significant bottleneck in the talent system; as such, the efficiency of the talent system is inherently limited. The reliance on lower-league clubs to facilitate senior performance experiences for developing senior athletes is common practice in team sports, including English soccer. However, the unequal distribution of lower league clubs relative to each Premiership club creates unequal opportunities for players between organisations and may contribute the different players trajectories demonstrated in Chapter 6. In this sense, the creation of a domestic U20's competition may help provide more equal opportunities and encourage greater junior-senior selection. However, this would have greater resource implications for the academies if required to select more senior academy players to meet quotas, and may reflect the constraints of such policies perceived at the junior academy regarding DPP (10% playing population) and minimum two teams for U16 and U17 competitions.

Through implementing a research design considering both the macro talent system and the meso-level organisations with a mixed methods approach, the thesis highlights that effective TDE practices cannot be fully understood without considering the surrounding system design, context, and purpose. This interaction between the levels of the talent system is an area that has received little attention in previous research.

#### **7.4 Limitations of thesis**

Whilst this thesis had access to a substantial dataset to inform quantitative analysis, there were several limitations associated with this dataset. Concerning the PDG registration lists, only one academy had a complete set. This limited the analysis in each of the quantitative chapters.

Combined with the lack of any DPP data, the analyses have not been able to provide a comprehensive analysis of the entire talent system. The missing PDG registration lists means it is likely some players developed by the academies have not been accounted for if they were not registered as an EAP at any stage. The quantitative studies have also been reliant upon the data provided by PRL, as such the studies are limited to the data available to PRL. For example, considering the academies, this thesis has focused on the regional academies, and has not considered other TDEs, such as the academies associated with clubs in the RFU Championship (e.g., Coventry or Ealing Trailfinders). As Chapter 6 highlights, there are potential routes to the Premiership via the lower leagues. In this sense, there are potential player development trajectories unconsidered by this thesis.

Chapters 3 and 6 implemented analyses centred around players achieving a Premiership appearance. Whilst Premiership debut might justify considering a player as ‘elite’ (Swann et al., 2015), and provide a marker to assess efficiency and effectiveness, I have highlighted throughout the thesis the need to look beyond this. Whilst Chapter 5 attempted to address this limitation by considering total match appearances to data, the recency of the project database posed as a limitation. As such, a future retrospective study with a deeper dataset may wish to consider developed players’ Premiership careers beyond debut.

Whilst there may be similar elements between English rugby union and other sports or nations (e.g., multiple academy structure), comparisons should consider potential differences between contexts (e.g., degree of professionalisation, age of selection etc.). As such, findings may not be transferable to other sports or national contexts (Gavin et al., 2024). For example, whilst both operating an academy-club structure and operating within the same national culture, there are significant differences between English soccer and English rugby union. As demonstrated in

Chapter 4, English rugby union academies are significantly reliant upon concurrent environments, specifically schools in the junior academy, which is not the case for English soccer academies. Whilst both sports operate academy boundaries, soccer academies manage academy boundaries by travel time rather than geographic region. Otherwise, English soccer demonstrates a higher degree of professionalism at a younger age compared to English rugby union. As such, it should be acknowledged that the results and implications of this thesis may be limited to the English rugby union context.

Due to COVID-19, the 2019/20 season was significantly disrupted. With play being suspended for several months, PRL implemented a twice weekly match schedule to conclude the season, with each Premiership club having an 'A Team' and a 'B Team'. To ensure there were enough players to field two teams, significantly more players made a Premiership debut this season and were unlikely to have had a 'normal' progression to the Premiership. Chapters 1 and 6 did not take this into account, acting as a limitation. Reflecting on Chapter 3, the conversion rates may be inflated by higher than usual debuting Premiership players to meet the demands posed by COVID-19. Otherwise, players may have had a quicker progression than usual and distort the results presented in Chapter 6.

## **7.5 Recommendations for future research**

Alongside considering the implications of this body of work, it is also important to consider several limitations which may be addressed with future research. Chapter 3 highlighted that beliefs about talent matter; practitioners' perspectives had the potential to influence which players received more resourcing and support, with players perceived to be high-potential early being the most likely population to become a Premiership player. Future research may wish to consider what player attributes are considered when nominating a player as an EAP, why some players are nominated

relatively early and late, and consider in greater detail whether contextual factors influence nomination. Chapter 3 and 6 results highlighted potentially different developmental experiences between players given high-potential status early and late; qualitative research may be best positioned to understand the players' perceptions of status and how it influences development. Given that EAPs are identified for their potential future elite performance and are not necessarily the highest performing junior players, future research may consider the ability of coaches to evaluate this potential. Labelling theory suggests that a label given to an individual may influence wider social interactions and affect the labelled individuals behaviour (Klimecká, 2024). In this sense, future research may wish to consider how conferring high-potential status influences the interactions between the athlete with their peers and all development stakeholders across the multiple concurrent environments. In this sense, future research may wish to consider how labels may influence the coherence of an athlete's development. Otherwise, from the perspective of resource allocation and investment, it would be interesting to consider possible 'sunk cost' effects impacting EAP conversion (cf. Farah & Baker, 2021), considering whether the sunk cost of investment in these players as juniors influences decisions to retain them in the talent system.

Chapter 4 presented a study which highlighted the complexity of a talent system and how the policies set by the macro-level influenced the actions of the meso-level, ultimately impacting the micro-level. Recognising the influence of concurrent environments and the especially perceived strong influence of schools, future research may wish to qualitatively consider how schools and other concurrent environments impact development, what they contribute to the development curriculum, and the degree of perceived coherence between environments. Whilst Chapter 5 reported that the distribution of higher performing rugby schools did not seem to impact the outcomes of TD, a study qualitatively considering the role of schools may be able to consider how they impact developmental experience and the processes of TD. Otherwise, a quantitative network

analysis could map the extent of the concurrent environments to indicate what proportion of the extended talent development network are directly influenced by the macro policymaking organisations.

Albeit not presented in many focus groups to be included as a result in Chapter 4, some participants spoke of the perception of academy staff roles, claiming often academy roles are seen as developmental roles for staff wishing to pursue careers in high-performance environments. This reportedly had knock-on effects to staff turnover and the implementation of long-term strategies. Future research may wish to consider how staff perceptions of their role, and their individual ambitions, influence TD practice. Otherwise, reported in Chapter 4 was the importance of the perceptions of senior high-performance staff, such as head coaches. Future research may wish to consider how the decisions and perceptions of these specific staff members shape the integration between the academy and senior club.

Chapter 5 considered potential associations between resources and academy TD outcomes quantified by number of Premiership players developed and number of subsequent Premiership appearances. Findings indicated a limited relationship between resources and outcomes, with only Staff Count having a significant negative relationship. However, as highlighted throughout this thesis, there is a need to consider processes as well as outcomes in evaluating effectiveness. As such, future research may wish to consider additional metrics such as the Talent Development Environment Questionnaire (Li et al., 2015), which may be able offer insights into the quality of the academy programmes in comparison to resources. Whilst this study was designed to consider the macro system to inform strategic policy decisions, case study research considering specific academies and their contexts may be best positioned to decipher and inform practice on the meso-level of the talent system. Future research may wish to explore the integration of academy and

school concurrent TDE environments, considering the potential influence of all rugby playing schools in supporting TDE operations and talent development.

Reflecting on the limitation posed by not specifically accounting for the disruptions of COVID-19, future research may wish to investigate the impact of this naturally occurring event on English rugby union TD (Costello et al., 2022). With the inclusion of an A-team and a B-team to catch up on match fixtures, this season may present a case-study of how increased senior-academy playing opportunities in the Premiership has influenced development and retention of Premiership players. A future retrospective analysis could consider whether players debuting this season were more or less likely to maintain Premiership status compared to players debuting in other seasons.

Finally, this thesis was limited to retrospective analyses. Future research may wish to implement prospective, longitudinal research design and track players' journeys through the talent system. Considering the findings of Chapter 6, future research may benefit from quantitatively and qualitatively tracking the journeys of players who may be considered 'Hares', 'Tortoises' or 'Falcons'. With a current lack of longitudinal mixed-methods research in the boarder TD literature (Dunn et al., 2023), this may present a valuable contribution to TD scholarship. Otherwise, research may wish to track and compare the developmental experience of academy players in Premiership academies or RFU academies, and state or independent schools to better understand potentially different archetypes of player and their development.

Finally, as highlighted in Chapter 2, the general literature on rugby union talent development beyond the micro level is limited across national contexts. As with other sports, talent system design and policy are inherently shaped by broader national, cultural, and structural factors (Cahill & MacNamara, 2023; De Bosscher et al., 2016). It is likely, however, that other rugby-playing

nations experience similar challenges associated with developing players within their specific contexts, and there may be opportunities for mutual learning between systems. For example, school TDEs play a substantial developmental role in both South African (South African Rugby, 2019) and Irish rugby union (Irish Rugby Football Union, 2018), whereas in New Zealand there are dispensations to alter challenge levels based upon junior player body mass (Cassidy, 2018). Future research may therefore benefit from adopting an international perspective and examining how national contexts influence the guiding policies, structures, and stakeholder relationships within successful rugby union nations, particularly in relation to the development of senior elite players.

## **7.6 Researcher reflection and development**

As this project progressed, I had multiple and significant opportunities to expand my skills, strengthen my methodological understanding, and develop as a researcher. At the outset of the PhD, although I had some experience using statistical analysis both in research and to guide real-world decision making, the scale, complexity, and analytical demands of this project were greater than anything I had previously encountered. The scale, inconsistency, and longitudinal nature of the datasets provided by PRL required me to substantially develop my data management and cleaning capabilities. Much of the early analytical work involved collaborating closely with PRL and the Insight Research Ireland Centre for Data Analytics to integrate multiple datasets, reconcile inconsistent player identifiers, resolve missing or incomplete records, and design transparent and reproducible processes for dataset construction. Whilst time-consuming, this extensive data cleaning process proved foundational in enhancing my technical competence, deepening my appreciation of how data quality influences analytical decisions, and enabling me to familiarise myself with the breadth and nuance of the PRL data archive. Being directly involved in the data cleaning and preprocessing stages also strengthened my understanding of how early decisions in the analytical pipeline can shape model performance, output stability, and interpretability. In

retrospect, gaining confidence in making these decisions was a key point in my development as an applied quantitative researcher.

From a qualitative research perspective, I entered the PhD with very limited experience. However, recognising the central importance of qualitative enquiry to the aims of this thesis, and the depth and breadth it could add to understanding and informing the talent system, I made a deliberate commitment to developing competence in this area. This involved engaging with qualitative research workshops, seeking guidance from supervisors, and immersing myself in the iterative, interpretive nature of thematic analysis. Through this process, I developed a much richer appreciation of how qualitative insights can contextualise and challenge quantitative findings, ultimately strengthening the mixed-methods design of the thesis. This shift not only enhanced the methodological depth of the thesis but also broadened my perspective on how different forms of evidence can be integrated to understand complex talent systems.

The novelty of this thesis lies in its real-world practical application to the English rugby union talent system. However, in that novelty, I became increasingly conscious that my decisions (analytical, methodological, and interpretive) may have meaningful impact on the talent system and the individuals operating within it. As such, an important part of my development involved learning to reflect deeply on research questions, justify methodological choices, implement appropriate statistical techniques, and interpret findings with contextual understanding.

A significant part of my development as a researcher has not only involved designing and conducting robust analyses, but also learning how to navigate the convergence of research and practice, and the politics of communicating findings to policymakers and practitioners. Throughout the project I have co-constructed research questions, translated analytical outputs into accessible

narratives with actionable implications, and presented results to stakeholders. Collectively, these experiences have shaped how I now approach applied research, emphasising collaboration, transparency, and the responsible use of evidence in high performance sport contexts.

## **7.7 Conclusion**

To conclude, this thesis offers original and novel contributions to the TD literature, showcases a comprehensive and multi-dimensional investigation of the English rugby union talent system, and has developed insights capable of informing TD policy and practice. The mixed-methods approach enabled a nuanced understanding of the influences of policies and resources, and of the interaction between the macro and meso levels of the talent system. The presented work has impacted policy-making decisions and practitioner perceptions in English rugby union.

This thesis demonstrates that TD operates as a complex, adaptive system where standardised policies produce highly variable outcomes depending on organisational context, resourcing challenges, and stakeholder interactions. Through a comprehensive analysis of the English rugby union talent system, this work challenges fundamental assumptions that have guided both research and practice in TD, suggesting that effectiveness depends on how resources are utilised rather than simply having more resources, and that multiple pathways through the talent system must be supported.

The theoretical contributions extend well beyond the specific sporting context examined. This research provides a new understanding of how the macro-level may differently interact with the various meso-level organisations contexts to produce different outcomes, suggesting organisational contexts shape how standardised policies work in practice. The demonstration that ‘beliefs about talent’ operate systematically through institutional mechanisms like the EAP policy represents a

significant advance in understanding how talent becomes socially constructed within organisational systems. Crucially, the finding that concurrent environments operate with potentially conflicting objectives fundamentally challenges existing TD models which may assume coherence across an athlete's development experience.

The practical implications are significant and immediate. This research has already influenced policy discussions within English rugby union regarding resource allocation strategies, state school provision, and academy evaluation frameworks. The evidence that academy effectiveness varies substantially (contribution to net development 2.33% to 12.84%) provides justification for differentiated approaches to system management. The identification of three distinct pathway archetypes ('Hares', 'Tortoises', and 'Falcons') offers a practical framework for understanding and supporting different development trajectories.

Looking forward, this work establishes a research agenda that could transform how talent systems are designed, managed, and evaluated. The shift from seeking universal 'best practices' to developing contextually appropriate effectiveness strategies reflects an evolution in the field that acknowledges the complexity of human development in organisational contexts, whilst the evidence informed policy recommendations provide immediate guidance for system improvement. The significance in this thesis lies not just in its contributions to understanding the English rugby union talent system, but in demonstrating how rigorous, multi-dimensional research can inform evidence-informed policy in complex organisational contexts. As talent systems face increasing pressure to demonstrate effectiveness and efficiency, the methodological approaches and theoretical insights developed here provide essential tools for meeting these challenges whilst ensuring that systems serve the developmental needs of all participants, not just those who reach elite performance levels.

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## Appendices

### *Appendix a - Chapter 5 Academy Managers brief*



#### **Player Development Project - Examining the 'DNA' of the Premiership Rugby Player**

##### **Study Overview**

Academies invest significant resources to develop young rugby players through academy programmes. Our previous work as part of this research project has highlighted differences between academies in terms of effectiveness and efficiency. The next stage of the PRL research project concerns investigating the factors impacting academy effectiveness and efficiency, and how academies use limited resources.

##### **Focus Groups**

To meet the aims of this study, focus groups with staff will be conducted at each academy. Researchers will present an overview of your academy's data and answer any questions you may have. Following this presentation, focus group members will engage in discussion led by researchers to explore the presented findings in relation to your academy.

##### **Participant Criteria**

We would appreciate each academy to nominate a maximum of 8 members of staff to participate in the focus groups. The following criteria should be implemented to identify suitable participants:

- Role in the academy which interacts with and influences player pathway
- Role which influences policy and decision making in academy operations

Examples may include –

Academy Manager, Assistant Academy Manager, DPP Manager, senior Pathway Coaches (DPP, U16-U18, Senior Academy), Athletic Development Coaches, senior Support Staff (Physiotherapists, Psychologists etc.), Head of Rugby Operations, Academy Administrator

Please name these staff when responding to the email to confirm a time and date for the focus group to be conducted.

**If you have any questions or would like more information please contact:**

Amy Shelley

[amy.shelley7@mail.dcu.ie](mailto:amy.shelley7@mail.dcu.ie)



## Participant Information Sheet

### Study Title:

Examining the 'DNA' of the Premiership Rugby Player

### Organisations:

Dublin City University School of Health and Human Performance (DCU), Insight Centre for Data Analytics, Premiership Rugby Limited (PRL)

### Investigators:

Dr Áine MacNamara (PI), Dr Jamie Taylor, Dr Stephen Behan, Amy Shelley (student)

### Introduction:

You are invited to take part in a focus group discussion as part of a research project commissioned by PRL and conducted by DCU. Before you decide whether to take part, you need to understand why the research is being done and what it would involve for you. Please take the time to read the following information carefully. Please use the contact information provided if there is anything that is not clear or if you would like more information.

### Purpose of Research

PRL has commissioned research to investigate the 'DNA' of the Premiership player, with the purpose to inform strategic decision making influencing the talent system and understand good practice. This current study aims to explore and understand the contextual factors each Premiership academy contends with which may influence their strategic allocation of resources throughout the academy's talent programme and factors which impact upon the academy's development of Premiership players.

### Do I have to take part?

It is entirely up to you to decide. If you choose to participate in the focus group, we will ask you to complete a consent form to confirm that you have agreed to take part. You will only be able to take part if you have completed this consent form.

### What are the possible disadvantages, side effects, risks, and/or discomforts of taking part in this study?

There are no anticipated disadvantages, side effects, risks, and/or discomforts of taking part in this study as the focus group will only ask you about your own experiences and assessments.

**What are the possible benefits of taking part in this study?**

Your views and assessments will contribute to the evidence the project is collecting and will help to highlight good practice - overall aiming to improve the academy pathways.

**Incentives**

There will be no payments or other incentives for participating in the focus groups.

**Will my taking part be kept confidential?**

We will not report your name or anything that would make you personally identifiable in any outputs from the research and all best endeavours will be made to ensure that data in any publications is anonymised. All participants and their club will be given a pseudonym for the purposes of reporting, and any identifying information will be removed to ensure confidentiality. No names or personal information will be used during study analysis, discussion, or publication.

**How will my data be used?**

The focus group will be recorded and transcribed, after which the recording will be deleted. Transcriptions will be securely secured on an encrypted DCU Google Drive, requiring two factor authentication to access files and only accessible by the research team. Analysis of data will be in accordance with data protection legislation.

**What will happen when the study ends?**

The collected anonymised data will be available in a published report. After research publication, all stored information will be permanently deleted.

**What will happen to the results of the study?**

The pseudo-anonymised findings from this study will be made available to PRL via report and presentation to the project steering group committee, will be included in Amy Shelley's PhD thesis, and may be further disseminated via journal publication. No academics will be individually identifiable.

**What will happen if I don't want to carry on being part of the study?**

Participation in this study is entirely voluntary. Refusal to participate will not affect you in any way. If you agree to participate, you may nevertheless withdraw from the study at any time without affecting you in any way. You have the right to withdraw from the study completely and decline any further contact by study staff after you withdraw. However, if the focus group has already commenced, we will be unable to remove your pseudo-anonymised responses from the transcription.

This study has been reviewed and approved by the Dublin City University Research Ethics Committee. Approval was granted on 21/12/2022, reference: DCUREC/2022/262. PRL has granted their written consent for data collection to occur.

**Who is funding the study?**

This is a targeted project through the Insight Centre for Data Analytics and the School of Health and Human Performance in collaboration with PRL. The Insight Centre is a Science Foundation Ireland funded entity. Grant number: SFI/12/RC/2289\_P2.

**Who should I contact if I wish to make a complaint?**

Any complaint about the way you have been dealt with during the study or any possible harm you might have suffered will be addressed. Please address your complaint to:

Dr Declan Raftery, Chief Operations Officer

Phone number: 003531 700 5117

Email Address: [coo@dcu.ie](mailto:coo@dcu.ie)

If you wish to make a complaint to the DCU research team about this project, please contact:

Dr Áine MacNamara

Email Address: [aine.macnamara@dcu.ie](mailto:aine.macnamara@dcu.ie)

If you wish to make a complaint to PRL about this project, please contact:

Neil McCarthy

Email Address: [nmccarthy@premiershiprugby.com](mailto:nmccarthy@premiershiprugby.com)

**What if I want more information about the study?**

If you have any questions about any aspect of the study, or your participation in it, not answered by this participant information sheet, please contact:

Amy Shelley

Email Address: [amy.shelley7@mail.dcu.ie](mailto:amy.shelley7@mail.dcu.ie)

**Thank you for taking the time to read this Participant Information Sheet**



School of Health and Human Performance, Dublin City University  
**PLAIN LANGUAGE STATEMENT**

**Project Title:** Examining the DNA of the Premiership Rugby Player

**Investigators:** Dr. Áine MacNamara, Prof. Noel O'Connor, Dr Jamie Taylor, Dr. Stephen Behan and Ms Amy Shelley

**University Department:** School of Health and Human Performance and the Insight SFI Research Centre for Data Analytics

**Introduction to the Research Study**

The aim of this research is to explore and understand the contextual factors each Premiership academy contends with which may influence their strategic allocation of resources throughout the academy's talent programme, and factors which impact upon the academy's development of Premiership players. Previous research has shown that effective talent development is crucial to the quality, success and sustainability of many sport teams and as such, there is a growing call for an evidence informed approach. This project aims to obtain the necessary evidence to enable Premiership Rugby primary to make informed decisions in developing their talent pathways.

This study is being run out of Dublin City University and is a collaboration between the School of Health and Human Performance, the Insight SFI Research Centre for Data Analytics, and Premiership Rugby.

**Involvement in the Research Study**

If you consent, you will be involved in a study looking at Premiership Rugby academies practices, as described above.

- You will be required to attend one focus group discussion for a duration of approximately 90-minutes, to discuss your experiences in Premiership Rugby academies.
- This focus group will be between you, fellow academy staff members and principal investigator(s).
- All focus groups will be recorded and transcribed.
- You will not be asked anything other than your experience and involvement with the academy, you will have to consent to share your data.
- You will have the right not to take part or stop taking part in this study at any time you wish.

**Privacy Notice**

- Data protection concerns the safeguarding of privacy rights of individuals in relation to the processing of their personal data. Personal data means any information relating to an identified, or an identifiable, living individual (e.g. name, email address, contact details, consent form, research files etc.)
- By participating in this Study, you will be submitting your personal data to the School of Health and Human Performance and the Insight SFI Research Centre for Data Analytics at DCU. As such, DCU is the Data Controller and must comply with data protection rules under the General Data Protection Regulation (GDPR) and the Data Protection Acts 1988 to 2018. DCU, as a Data Controller, is responsible for the personal data you provide, based on your freely given and informed consent. You can withdraw your consent at any time, through the contact details below.
- This study will use your personal information under two legal bases as defined by the General Data Protection Regulations 2016: Because we feel this study is important for scientific research (Article 9(2)(i)) and because we feel the information you provide could be important for public interest (Article 6(1)(f)).
- This study is completely confidential. You will be assigned a code number and will not be identified by name. Consent forms will be secured in an encrypted electronic DCU file. Results from this study will be used by the principal investigators to write a report that may be published and presented publicly. All data will be presented anonymously, individuals will not be identified.

- There will be no automated decision-making or profiling of any personal data in this study. This means that we will not use your personal data to make any predictions about you. Your information will not be processed for any other reason than for this study and it will not be transferred to any other country or organization.
- Under data protection rules, individuals have a number of rights, including:
  - The right to be informed of what happens to personal data relating to you
  - The right of access to personal data relating to you, and to obtain a copy
  - The right to rectification if an error is contained in the personal data relating to you
  - The right to erasure of personal data relating to you (in certain circumstances)
  - The right to restrict processing of personal data relating to you (in certain circumstances)
  - The right to data portability
  - The right to object to processing of personal data relating to you (in certain circumstances)
  - Rights in relation to automated decision making and profiling
- These rights are available where the applicable criteria are met and subject to certain exceptions under data protection law. For example, it may not be possible to comply with a request to erase data where DCU has a legal obligation to retain records, or where it is necessary and proportionate to keep such data for the purposes of defending legal claims, and/or to protect the vital interests of a data subject.
- To exercise your rights, or if you have any questions in relation to your personal data, you may contact the DCU Data Protection Unit at: [data.protection@dcu.ie](mailto:data.protection@dcu.ie). For further information, please visit: [DCU Data Protection Unit](#). General information on how DCU collects, uses, and discloses personal data, and on your data protection rights, is available on the [DCU Privacy Policy](#).
- You also have the right under data protection law to complain to the Data Protection Commission (see [www.dataprotection.ie](http://www.dataprotection.ie)), but we ask that you please contact us in the first instance so that we can resolve any issues arising.

Participants will not receive benefits over anyone not participating in the study. The study aims to highlight best practice and review resource allocation, with an overall aim to improve the academy pathways which will benefit those involved, including the participants.

Upon completion of the study, all personal data will be deleted. At this stage all data will be fully anonymized, and the research team will keep this data for comparison with future research study.

Confidentiality of information can only be protected within the limitations of the law - i.e., it is possible for data to be subject to subpoena, freedom of information claim or mandated reporting by some professions.

Participation in this research is voluntary. You can withdraw from this study at any time without giving a reason. If you withdraw, any data identifiable to you will be deleted and information about your involvement will be discarded. If you withdraw after the focus group has commenced your responses will not be able to be removed from the transcript. You can contact the researchers if you have questions about this.

If you need any further information now or at any time in the future, please contact:

**Name:** Amy Shelley, PhD Candidate – [amy.shelley7@mail.dcu.ie](mailto:amy.shelley7@mail.dcu.ie)

**Academic supervisor:** Dr Áine MacNamara – [aine.macnamara@dcu.ie](mailto:aine.macnamara@dcu.ie)

If participants have concerns about this study and wish to contact an independent person, please contact:

The Secretary, Dublin City University Research Ethics Committee, c/o Research and Innovation Support, Dublin City University, Dublin 9. Tel 01-7008000, e-mail [rec@dcu.ie](mailto:rec@dcu.ie)





School of Health and Human Performance, Dublin City University  
**INFORMED CONSENT FORM**

**Project Title:** Examining the DNA of the Premiership Rugby Player  
**Investigators:** Dr. Áine MacNamara, Prof. Noel O'Connor, Dr Jamie Taylor, Dr. Stephen Behan and Ms Amy Shelley  
**University Department:** School of Health and Human Performance and the Insight SFI Research Centre for Data Analytics

**The purpose of the research**

The aim of this research is to explore and understand the contextual factors each Premiership academy contends with which may influence their strategic allocation of resources throughout the academy's talent programme, and factors which impact upon the academy's development of Premiership players. Previous research has shown that effective talent development is crucial to the quality, success and sustainability of many sport teams and as such, there is a growing call for an evidence informed approach. This project aims to obtain the necessary evidence to enable Premiership Rugby primary to make informed decisions in developing their talent pathways.

This study is being run out of Dublin City University and is a collaboration between the School of Health and Human Performance, the Insight SFI Research Centre for Data Analytics, and Premiership Rugby.

**What is required to take part in the research**

If you consent, you will be involved in a study looking at Premiership Rugby academies practices, as described above.

- Your participation in the research project will be confidential.
- You will not be asked anything other than your experience and involvement with the academy, you will have to consent to share your data.
- You will have the right not to take part or stop taking part in this study at any time you wish.
- The researcher will request that the focus group discussion be audio recorded to facilitate data collection and subsequent analysis.

Participant – please complete the following (Circle Yes or No for each question)

<i>I have read the Plain Language Statement (or had it read to me)</i>	Yes/No
<i>I understand the information provided</i>	Yes/No
<i>I understand the information provided in relation to data protection</i>	Yes/No
<i>I have had an opportunity to ask questions and discuss this study</i>	Yes/No
<i>I have received satisfactory answers to all my questions</i>	Yes/No

This study is completely confidential. You will be assigned a code number and will not be identified by name. Consent forms will be secured in an encrypted electronic DCU file. Results from this study will be used by the principal investigators to write a report that may be published and presented publicly. All data will be presented anonymously, individuals will not be identified. Your information will not be processed for any other reason than for this study and it will not be transferred to any other country or organisation. Upon completion of the study and publication, all personal data will be permanently deleted. At this stage all data will be fully anonymised, and the research team may keep this data for comparison with future research studies.

Confidentiality of information can only be protected within the limitations of the law - i.e., it is possible for data to be subject to subpoena, freedom of information claim or mandated reporting by some professions.

Participation in this research is voluntary. You can withdraw from this study at any time without giving a reason. If you withdraw, any data identifiable to you will be deleted and information about your involvement will be discarded. If you withdraw after the focus group has commenced your responses will not be able to be removed from the transcript. You can contact the researchers if you have questions about this.

If you need any further information now or at any time in the future, please contact:

**Name:** Amy Shelley, PhD Candidate – amy.shelley7@mail.dcu.ie

**Academic supervisor:** Dr Áine MacNamara – aine.macnamara@dcu.ie

**Signature:**

I have read and understood the information in this form. My questions and concerns have been answered by the researchers, and I have a copy of this consent form. Therefore, I consent to take part in this research project

**Participants Signature:** \_\_\_\_\_

**Name in Block Capitals:** \_\_\_\_\_

**Witness:** \_\_\_\_\_

**Date:** \_\_\_\_\_

*Appendix e – Chapter 5 Focus Group Guide*

Rationale	Question	Follow up/Probe
How do different academies view effective practice?	How do you determine if your programme is effective?	Would the rest of the organisation agree? Are you effective if your players progress elsewhere?
	What do you consider the most important stages of the academy to be?	Does your resourcing [time, attention, finances] reflect this?
How do they reflect on the data presented to them?	Considering your data compared to the wider system and averages, do you have any reflections?	Why do you think these results are as they are? Are you surprised by your results or are they expected? Why? How do you decide to allocate your resources to different parts? Has this changed in the last few years? [If attempting to guess Club IDs] Why do you think that data?
What barriers are there to efficient and effective practice?	Keeping the same resources you have now, what would you do differently if there were no rules or regulations?	What factors would you take into consideration? What factors do you think limit your effectiveness/efficiency? If you were to start again, where would you want to invest your resources?

Notes: Use prompts throughout presentation to facilitate ongoing discussion



Dr Aine MacNamara  
School of Health and Human Performance

21st December 2022

**REC Reference:** DCUREC/2022/262

**Proposal Title:** Examining the DNA of the Premiership Rugby Player: A multimethods approach

**Applicant(s):** Dr Aine MacNamara, Prof Noel O'Connor, Dr Stephen Behan, Dr Jamie Taylor, Ms Amy Shelley

Dear Colleagues,

Thank you for your application to DCU Research Ethics Committee (REC). Further to notification review, DCU REC is pleased to issue approval for this research proposal.

DCU REC's consideration of all ethics applications is dependent upon the information supplied by the researcher. This information is expected to be truthful and accurate. Researchers are responsible for ensuring that their research is carried out in accordance with the information provided in their ethics application.

Materials used to recruit participants should note that ethical approval for this project has been obtained from the Dublin City University Research Ethics Committee. Should substantial modifications to the research protocol be required at a later stage, a further amendment submission should be made to the REC.

Yours sincerely,

**Dr. Melrona Kurrane**  
Chairperson  
DCU Research Ethics Committee



Note: Please retain this approval letter for future publication purposes (for research students, this includes incorporating the letter within their thesis appendices).