

Institution: Leeds Beckett University		
Unit of Assessment: 24 – Sport and Exercise Science, Leisure and Tourism		
Title of case study: Advancing rugby policy, player development and performance		
Period when the underpinning research was undertaken: 2008 to 2020		
Details of staff conducting the underpinning research from the submitting unit:		
Name(s):	Role(s):	Period(s) employed by submitting HEI:
Prof Kevin Till	Professor	Feb 2012 - present
Prof Ben Jones	Professor	Sept 2012 - present
Prof John O'Hara	Professor	Sept 2001 - present
Prof Carlton Cooke	Professor	Jan 1990 - 2015, June 2020 - present
Dr Dan Weaving	Lecturer	Sept 2015 - present
Dr Sarah Whitehead	Lecturer	Feb 2017 - present
Dr Greg Roe	Senior Research Fellow	Sept 2014 - present
Dr Josh Darrall-Jones	Research Fellow	Feb 2013 - present
Dr Nessian Costello	Lecturer	Sept 2015 - present
Dr Sean Scantlebury	Post-doc Research Fellow	Sept 2015 - present
Period when the claimed impact occurred: January 2014 to Dec 2020		
Is this case study continued from a case study submitted in 2014? No		
1. Summary of the impact		
<p>To overcome the challenges associated with attaining inclusive participation and performance of rugby players, Leeds Beckett University's Carnegie Applied Rugby Research (CARR) Centre works in partnership with rugby national governing bodies (Rugby Football League [RFL], Rugby Football Union [RFU]) and local professional clubs (e.g., Leeds Rhinos) to implement and translate multidisciplinary scientific research to advance evidence-informed rugby policy, player development and performance. Since 2014 and based upon CARR's research, significant changes to national policy within rugby are clear, including talent identification and development strategies (e.g., player opportunities increased from 1,000 to 8,000 players per year in RFU), nationwide fitness testing implementation (e.g., over 3,000 players assessed), and match-play and training recommendations (e.g., to 26 clubs). These national policy changes have resulted in significant benefits to coaches' practice (e.g., increased training intensity), and player development and performance (e.g., more player centred) across rugby.</p>		
2. Underpinning research		
<p>Youth sport programmes aim to develop healthy young athletes whilst attaining inclusive participation and success across all levels. This is an aim of Leeds Beckett University's (LBU) CARR Centre. The CARR Centre is responsible for 160+ scientific papers and research income exceeding ~£3million from professional clubs, national and international (i.e., World Rugby) governing bodies since 2008, culminating in research centre status in 2019. The CARR centre's research has identified that there are numerous problems associated with developing '<i>healthy young athletes</i>' and '<i>inclusive participation and success across all levels</i>' within youth rugby. All the research was undertaken in partnership with the relevant national governing body or professional clubs and involved applying scientific methods within the field. The key underpinning research findings are summarised under four key points and described below:</p>		
1. Talent Identification favours the Older, Mature and Bigger Youth Rugby Player		
<p>CARRs research spanning 12 years (i.e., 2005-2017) has evaluated the factors impacting upon talent identification (i.e., being selected by professional teams), talent development (i.e., receiving greater provision to improve) and career attainment (i.e., how successful players</p>		

become) in rugby using large samples (n=1,000+) and longitudinal retrospective research designs. Being older, more mature and bigger (Till et al., 2010a; 2011) during adolescence (~13-14 years of age) increases the likelihood of boys being identified by professional coaches. However, the research found that such factors do not relate to future career success, judged by whether they played professional rugby league (Till et al., 2014; 2016a [1]). The research has emphasised the need to delay talent identification until after maturity (~15 years of age), whilst increasing the number of talent development opportunities to more players within rugby.

2. Measuring Physical Performance is Vital for Rugby Player Development

CARR’s research has extensively evaluated the physical performance (e.g., strength, speed) of youth rugby players for the last 15 years (i.e., 2005-2020). A Sports Medicine systematic review [2] (including 17 publications from CARR) demonstrated how age, position and standard influence the physical performance of youth players. These findings demonstrated how physical performance improves with age, is greater within higher playing standards and what physical performance variables are related to different playing positions. This research has highlighted the importance of monitoring, analysing and training physical performance within rugby players. This research [3] also validated novel analysis methods using higher-dimensional analysis (i.e., a data reduction technique that allows enhanced data visualisation) to support the presentation of data to enhance coach feedback and reporting, which has been integrated into the RFU and RFL’s player monitoring tools.

3. Prepare Rugby Players for Competition: the ‘Worst-Case Scenario’

CARR’s research since 2014 has evaluated the physical (i.e., running and contact) demands of rugby competition using advanced microtechnology devices and analysis. Studies used large samples, across nine clubs ([4]; n=472), which are unique in this context. Comparisons between standards of the playing pathway (i.e., junior academy to senior professional) provided the maximal running and collision intensities of competition, which was provided by unique analysis developed by CARR (e.g., Weaving et al., 2018). This analysis has allowed coaches to evaluate the intensity of their training strategies to enhance player development and performance. These methods are now applied across all twelve Super League teams, which includes approximately 380 rugby league players (Dalton-Barron et al., 2020).

4. Rugby Match-Play causes Fatigue; It takes 48-72 hours to Recover

CARR’s research was the first to examine the fatigue and recovery profiles in youth rugby union competition (Roe et al., 2016) and training [5]. This research measured neuromuscular (i.e., jumping), muscle damage (i.e., blood markers) and psychological markers (i.e., mood) across ~20 players for 3 days post-match-play and training. The findings demonstrated it takes 48-72 hours to recover from match-play, which is heavily influenced by the number of collisions (Costello et al., 2018). These findings informed competition policies, training strategies and recovery for optimising rugby player health and performance.

While these four findings are presented as standalone underpinning research, they all interact and overlap. A recent systematic review ([6]; including 31 publications from CARR) in youth Rugby Union highlights this and the multidisciplinary nature of our research.

3. References to the research

Selected outputs represent original research conducted by academics in CARR. All are published in quartile 1 journals that reflect the specific foci of research presented and are peer reviewed by experts. Outputs were produced through externally funded research commissioned by the national governing bodies in rugby and professional clubs, which is a mixture of policy makers and end users:

RFU	RFL	Leeds	Bath	Yorkshire	Scottish	World	Wasps
		RLFC	RU	RU	RU	Rugby	RU
£130K	£170K	£610K	£560K	£295K	£33K	£90K	£105K

The scientific references to the peer reviewed publications referred to in Section 2 are:

- [1] Till K, Cobley S, Morley D, O'Hara J, Chapman C, & Cooke C. (2016) The influence of age, playing position, anthropometry and fitness on career attainment outcomes in rugby league. *Journal of Sports Science*, 34(13), 1240-1245.
<https://doi.org/10.1080/02640414.2015.1105380>
- [2] Till K, Scantlebury S, & Jones B. (2017) Anthropometric and physical qualities of elite male youth rugby league players. *Sports Medicine*. 47(11), 2171-2186.
<https://doi.org/10.1007/s40279-017-0745-8>
- [3] Till K, Jones B, Cobley S, Morley D, O'Hara J, Chapman C, Cooke C, & Beggs C (2016). Talent identification in youth sport: A novel methodology using higher-dimensional analysis. *PLOS One*. 11(5), e0155047. <https://doi.org/10.1371/journal.pone.0155047>
- [4] Whitehead S, Till K, Weaving D, Dalton-Barron N, Ireton M, & Jones B. (2019) The duration-specific peak average running speeds of European Super League Academy rugby league match-play. *Journal of Strength and Conditioning Research*, 30
<https://doi.org/10.1519/JSC.0000000000003016>
- [5] Roe G, Till K, Darrall-Jones J, Rock A, & Jones B. (2017) The effect of physical contact on changes in fatigue markers following rugby union field-based training. *European Journal of Sport Science*. 17(6): 647-655.
<https://doi.org/10.1080/17461391.2017.1287960>
- [6] Till K, Weakley J, Read D, Phibbs, P, Darrall-Jones J, Roe G, Chantler S, Mellalieu S, Hislop M, Stokes K, Rock A, and Jones B. (2020) Applied Sport Science for Male Age-Grade Rugby Union in England. *Sports Medicine Open*, 6, 14,
<https://doi.org/10.1186/s40798-020-0236-6>

4. Details of the impact

To overcome the challenges associated with attaining inclusive participation and performance within rugby, CARR's internationally recognised research has changed national (i.e., RFL and RFU) and local (e.g., Leeds Rhinos RLFC, Yorkshire RUFC) rugby policy and player development across the two national governing bodies and a total of 26 academy rugby programmes. These changes have occurred in alignment with the four underpinning research foci detailed above, which are key for developing healthy young rugby players whilst attaining inclusive participation and success across all levels. These changes have occurred through the established and extensive research collaborations, partnerships and consultancy opportunities with the professional organisations, explained by Yorkshire Rugby Academy Manager Ben Lazenby, who states: '*There's a number of [Leeds Beckett] staff that are working down at Wasps, Bath, Yorkshire and projects with England Rugby and World Rugby as well, and a lot of the information they're gathering is having a direct influence on what the game may look like in the future.*' [A].

Changing National Rugby Policy and Practice 1:

Rugby Talent Identification and Development Programmes delay the age of selection and increase the number of opportunities available

CARR's research (e.g., [1]) has directly changed the RFL and RFU talent identification and development programmes for young rugby players. This research has revolutionised talent identification policy and practice within rugby by changing the age when players are identified and selected from ~13 to ~15 years to reduce the influence of factors (e.g., maturity) associated with early identification [A to E] and has increased the number of player development opportunities available within a talent programme (e.g., from 1,000 to 8,000 in the RFU's Developing Player Programme) [B, C, E]. England Rugby Union's Under 18s coach, Jon Pendlebury, corroborates this impact: '*The work of Kevin Till on talent identification has delayed and broadened the RFU talent identification programme, whereby selection is delayed and more opportunities are provided to more players (approximately 600 players per each of the 14 RFU Regional Academies)*' [E]

Furthermore, this research has also influenced the implementation of a new reserve level (i.e., Over 18s) competition in rugby league [B] and the creation of a later maturing player programme at Leeds Rhinos RLFC [G]. The RFL's Chief on Field Officer, Dave Rotheram,

explained: *'In 2020, our player pathway has changed from a Under 16s-19s-1st Team to Under 16s-18s-Reserves-1st Team. This increases the opportunities for players to progress to Super League and was influenced by the long-term development work of Till and Jones.'* [B].

Furthermore, coach education of relative age and maturity amongst academy managers, coaches and scouts has been pivotal in increasing inclusivity for player development opportunities [A, B, C]. Overall, these significant policy changes to rugby's talent identification and development programmes have resulted in a greater number of players receiving talent development opportunities within the sports, as Yorkshire Academy Manager Ben Lazenby explained, *'Working with Kevin on this, within Yorkshire specifically, the information we have on maturation and age and general development of young people has meant the pathway itself has changed, becoming much more player centred.'* [A].

Changing Rugby Policy and Practice 2:

Implementation of a Nationwide Physical Testing Monitoring and Reporting System within Rugby

Based on the CARR's physical performance research (e.g., [2] & [3]), the RFL and RFU have implemented national fitness testing batteries within their player development programmes across all players aged 15-20 years [B, D, E]. Since 2016, ~2,500 young rugby union players (approx. 60% of academy players) have been fitness tested (previously none) and over 1,000 players (males and females) in rugby league. Clubs, coaches and players have been provided feedback on their physical performance compared against all players nationally as explained by England Under 18s coach Jon Pendlebury: *'The national fitness testing that has been implemented across all academies has been vital to understand the physical development of players and provide informed data to provide feedback, goal setting and programmes for all players.'* [E].

Within rugby league, this research has resulted in the RFL designing, disseminating and implementing an online, interactive physical profiling data visualisation and reporting tool [G, H] for use across all professional clubs, club staff and players [B, D, G]. The implementation of national fitness testing and reporting has benefitted clubs, coaches and players by providing objective data for player comparisons and evaluations. Furthermore, training programmes have advanced that allow players to improve their performances for enhancing the long-term career development of players within the sports [A, B, E]. This impact was identified by coaches in an analysis of their use of fitness testing in rugby league [F], where one coach said: *'It's good for players to see what they're up against. They get to see the team's results. At the end of the day, you're in competition. That's professional sport, there's literally no boundaries to where the game goes. I'd open it up to show what others (clubs) have got. I'd let every single player show their data, some players won't give a f*** they'll just be worried about themselves. But then all of a sudden there's someone here who thinks they're the bee's knees, who's s*** hot then all of a sudden there's someone bigger than me, stronger and faster than me, then I think that would give them a bit of a drive.'* [F].

Changing Rugby Policy and Practice 3:

Preparing Players for Competition Demands: the 'Worst-Case Scenario'

CARR's research (e.g., [4]) has significantly changed policy and club practices for preparing players for the demands of competition and player development. For example, academy match-play was identified as lower intensity (e.g., [4]), which has resulted in the RFL adding a three game Under 18 Academy Origin (i.e., Yorkshire vs Lancashire) into their fixture calendar benefitting over 40 players to experience higher-intensity competition to support their player development, as explained by RFL's Dave Rotheram: *'In 2019, we introduced the Academy Origin series (Yorkshire vs. Lancashire) at the Under 18 years level within the competition calendar. This has been influenced by the research of Whitehead on the intensity of rugby league academy match play. The series will provide 40 players within the game an enhanced level of match play to aid their development.'* [B].

A league-wide dissemination of match-play physical data was shared by the RFL across all twelve RFL Super League clubs [D] and all 14 RFU regional academies [E], which has influenced coaches' planning and practice [A, D, E, I]. Specifically, at Leeds Rhinos RLFC, this research has informed their Player Development Plan [G], which is the overriding plan for all coaches and staff at the club for players aged 13 years to senior professional, used for planning long-term player development strategies. An example of this is how the intensity of coaches' training sessions has significantly increased from 2017 to 2019 (e.g., running intensity increase of 10-15%). Coaches directly evidenced Whitehead's research on the worse-case demands of match-play as a major reason for changing their training practices [I], which this coach summarised in his use of the data and application to his training plan: *"I like to keep getting them stats and get the intensity up... the players are aware of it and make a conscious effort to raise their training standards."* [I].

Changing Rugby Policy and Practice 4:

Influencing Rest and Recovery Policies in Rugby Union

CARR's research on fatigue and recovery (e.g., [5] & [6]) has resulted in the RFU disseminating their Codes of Practice Age Grade Rugby policy. This policy states that *'Research from Leeds Beckett University using academy rugby union players, suggests that following contact or non-contact training, players are not fully recovered at 72 hours. Ensuring sufficient rest allows the child to recover and reduces the risk of injury'* [J] (p.20). This policy document recommends how often rugby players should train and play and has directly impacted upon the changes to a competitive fixture list in youth rugby union to reduce congested fixture lists [A, E] whilst also influencing Leeds Rhinos' Player Development Plan [G]. The implementation of these policies is vital for player health, reducing injuries, enhancing recovery and improving player wellbeing.

In summary, LBU's CARR research has changed national policy within both rugby codes that has subsequently impacted both coach and player development and performance. Such changes are aligned to the overall aim of youth sport programmes to develop healthy young athletes whilst attaining inclusive participation and success across all levels within the rugby codes.

5. Sources to corroborate the impact (indicative maximum of 10 references)

- [A] Ben Lazenby interview (Yorkshire RU Academy; Academy Manager)
<https://youtu.be/YshQa9mQ8UA>
- [B] RFL Testimonial (Dave Rotheram; RFL Chief On-Field Officer)
- [C] RFU testimonial (John Lawn; RFU Head of Game Development)
- [D] England Rugby League Testimonial (Kevin Sinfield MBE; Rugby Director and Head of England Performance Unit)
- [E] England Rugby Union Testimonial (Jonathan Pendlebury; England Rugby Union Under 18s Head Coach)
- [F] McCormack et al. (2020) *'It's Important, but it's not Everything'*: Practitioners Use, Analysis and Perceptions of Fitness Testing in Academy Rugby League, *Sports*, 8(9), 130.
- [G] Leeds Rhinos RLFC Player Development Plan (Official Document)
- [H] RFL National Player Profiling Tool (Developed by RFL for use by all clubs, the link is anonymised data only) <https://datastudio.google.com/reporting/db44f3b7-2c71-4542-8ed0-fc07d2d8a046>
- [I] Leeds Rhinos RLFC Evaluation of Training Intensity Report
- [J] RFU Age grade Rugby – Codes of Practice, (Official Document) August 2019,
<https://www.englandrugby.com//dxdam/83/8375ce67-40ff-4b70-a28f-fbbae518009a/AGR-CoP-Aug2019-final.pdf>