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Citation:

Bletsoe, J and Whitehead, S and Poolton, J and Sawczuk, T and Till, K (2023) A comparison of the match action characteristics of scholarship, academy, and senior rugby league: Influence on career progression. *International Journal of Performance Analysis in Sport*. pp. 1-13. ISSN 2474-8668  
DOI: <https://doi.org/10.1080/24748668.2023.2262837>

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Document Version:

Article (Published Version)

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**To cite this article:** James Bletsoe, Sarah Whitehead, Jamie Poolton, Thomas Sawzcuk & Kevin Till (27 Sep 2023): A comparison of the match action characteristics of scholarship, academy, and senior rugby league: influence on career progression, International Journal of Performance Analysis in Sport, DOI: [10.1080/24748668.2023.2262837](https://doi.org/10.1080/24748668.2023.2262837)

**To link to this article:** <https://doi.org/10.1080/24748668.2023.2262837>



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# A comparison of the match action characteristics of scholarship, academy, and senior rugby league: influence on career progression

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## ABSTRACT

This study aimed to (1) compare individual player match action characteristics between scholarship, academy, and senior (European Super League, ESL) levels of the rugby league player pathway, and (2) compare match actions between players that have progressed to play ESL and those that did not. Data was collected on 147 players from 95 senior, 69 academy, and 23 scholarship matches over three seasons. Matches were filmed via 2 angles and 26 match action characteristics (e.g. carry, missed tackle) were coded. Linear mixed models identified 48 significant differences in match action characteristics when accounting for playing position between playing levels. Over seventy percent of the differences were defensive match actions, indicating there are higher defensive match demands in the ESL when compared to academy and scholarship match play. Seven and eleven match actions characteristics were identified at scholarship and academy levels that differentiated between players who had progressed to play in the ESL and those who had not. All but one of these characteristics were attacking match actions, indicating a player's attacking qualities are important in their progression to the ESL. These results have implications for both talent identification and long-term athlete development in rugby league.

## ARTICLE HISTORY

Received 5 April 2023

Accepted 19 September 2023


## KEYWORDS

Rugby league; performance analysis; talent identification; youth; talent development

## 1. Introduction

Rugby league is an intermittent, contact sport played at professional and amateur levels across the world. Rugby league at the professional level in Europe (i.e. European Super League; ESL) and Australasia (National Rugby League; NRL) is a sport with a salary cap, which brings limitations on the amount of money professional teams can spend on their squad. There is some evidence that the use of a salary cap has improved competitive balance within ESL (Howarth & Robinson, 2008), as such, ESL teams need to use their finite salary resource wisely to sustain success.

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 Supplemental data for this article can be accessed online at <https://doi.org/10.1080/24748668.2023.2262837>

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In rugby league, and other sports, Talent Identification and Development Systems (TIDS) (Cobley & Till, 2015) are implemented through player pathways to recognise young talent and cultivate it with the end goal of producing elite players. Two of the key phases of these systems are defined by Williams and Reilly (2000): Talent Identification, recognising current participants with the potential to become elite performers; and Talent Development, providing athletes with a suitable learning environment so that talent can be realised. The identification, development, and coaching of talent through a player pathway system has been identified as very important in achieving success (Duthie, 2006; Burgess & Naughton, 2010; Smith, 2003). However, as Till and Baker (2020) discuss, although there has been an increase in the number of academic reviews in the areas of talent identification and development and its importance, there is little work which focuses on how the research can be applied in practice. Cupples and O'Connor (2011) also highlight the importance for greater transparency in what stakeholders are looking for as part of the talent identification and development process in rugby league.

In England, there has (until very recently) been three levels (scholarship, ages 14–16; academy, ages 16–18; and senior, ages 17+) within the rugby league playing pathway within professional clubs (Till & Bell, 2019). Although there has been significant research into the physical qualities (e.g. McCormack et al., 2020; Till et al., 2015, 2017) of youth players, there is limited research available on the match action characteristics (such as tackles, carries, etc), sometimes referred to as performance indicators (Whitehead et al., 2020; Woods et al., 2018) across the player pathway, especially taking into consideration scholarship (under 16) players.

Over the last decade, there has been an increase in research exploring the team and individual actions occurring during senior professional match-play that correlate to success or inter competition variances. A common finding is that making more metres in offence than your opposition is a significant predictor of success (Kempton et al., 2015; Parmar et al., 2018). More specifically, Woods et al. (2017) identified five performance indicators (i.e. try assists, metres in offence, line breaks, number of dummy half runs, offloads) as significant factors in match success during the 2016 NRL season. Defensive performance indicators have also been identified, such as missed tackle count (Woods et al., 2017) and conceding metres without the ball (Gabbett, 2014). There has also been research into the significance of the kicking game with Woods et al. (2017) indicating that having a more effective kicking game, being able to kick the ball further, can contribute to successful performances.

When comparing age group match characteristics, Woods et al. (2018) found significant differences between the NRL and Under 20s competition in Australia. Higher level competition matches (NRL) demonstrated more carries, tackles, and a lower number of missed tackles when compared to the lower level (Under 20's) competition indicating a significantly greater demand on players at the higher level (Woods et al., 2018). Dempsey et al. (2018) also found significantly higher carry and tackle occurrences in senior international rugby league when compared to junior international rugby league. These results suggest that the match action characteristics, especially around the carry/tackle component of the game, are higher in elite competition and have obvious practical implications when looking to both identify talent and develop players to progress to a higher standard of competition. In a study of match action characteristics along the playing pathway in England, Whitehead et al. (2020) compared the differences in

technical-tactical performance indicators between senior players and academy players. They identified two significantly different match action variables for backs (quick play the balls & carries), with senior players demonstrating a higher numbers for both; and two significantly different match action variables for forwards (defensive play the ball losses & collisions lost), which were both higher at the senior level. These results support some of the work by Woods et al. (2018) and Dempsey et al. (2018) indicating increased demands on players around the ball carrying and tackle areas of the game at higher levels of match play. One limitation of the study by Whitehead et al. (2020) was that it only included two groups along the player pathway. There is no research into match action characteristics in rugby league that has included all pathway levels (i.e. ESL, academy and scholarship in England). By researching any potential similarities or differences in these match action characteristics along the pathway a better picture of match demands can be identified, adding to some of the research into physical characteristics of players on the pathway (Till et al., 2015, 2017). Importantly, such work has the potential to be used to inform talent identification and development practices along the player pathway.

As Johnston et al. (2018) discussed, there is more to learn about the most appropriate methods of talent identification in elite sport. In both male youth rugby league and rugby union, three areas are commonly cited as methods of identifying talent: (i) *task* (i.e. participation history), (ii) *performer* (i.e. technical & tactical skills, physical factors, psychological characteristics), and (iii) *environmental* (i.e. relative age effects, socio-cultural influences) (Kelly et al., 2022). Although match actions have been identified as performance indicators (ie metres in offence, errors, missed tackles) (Kempton et al., 2017), to the authors' knowledge, no current research has looked to explore match action characteristics of players in academy and scholarship rugby league that have progressed to professional levels. Most match action characteristic research in rugby league (Whitehead et al., 2020; Woods et al., 2018) has looked to differentiate between current playing levels, rather than implement a retrospective design approach that has been recommended for talent research (Till & Baker, 2020). By implementing this research design a greater understanding of the characteristics of players earlier on the pathway, that have subsequently progressed to ESL can be explored. This retrospective knowledge of important match action characteristics along the player pathway could help to inform talent identification and development programmes within rugby league. It is important for development practitioners to base training processes around identified gaps in performance between pathway levels (Till et al., 2016).

Therefore, this study aimed to (1) determine the differences in individual player match action characteristics between scholarship, academy, and senior levels of the ESL rugby league player pathway, and (2) determine differences in individual match action characteristics between players that progressed to the professional ESL level and those who did not.

## 2. Methods

To achieve the stated aims a longitudinal, observational study design was used. Data was collected from one ESL professional club during 95 senior, 69 academy, and 23 scholarship matches across three competitive seasons (2017–2019). Senior Challenge Cup matches against non-ESL opposition were excluded. The data of a total of 147 players

was in the study, 22 players had observations from both scholarship and academy matches, 11 had observations from both academy and senior matches and 2 had observations from all three levels of match play. Scholarship players had an age range of 14 to 16, academy players had an age range of 16 to 18, and ESL players had an age range of 17 to 37.

To achieve study aim 2, the highest level on the rugby league player pathway that a player has achieved was determined up to and including the end of the 2022 ESL season. Players were placed into one of two groups depending on the highest level they have attained: ESL or Non-ESL. Players with a scholarship match observation had reached the following levels: ESL,  $n = 7$ ; Non-ESL,  $n = 67$ . Players with an academy match observation achieved the following levels: ESL,  $n = 19$ ; Non-ESL,  $n = 36$ .

A total of 3,195 match observations (numbers of players times number of matches) were collected across the three years with a player average of  $22 \pm 21$  match observations (range: 1–88). Match observations per player were  $31 \pm 25$  (range: 1–88) for senior matches,  $21 \pm 14$  (range: 2–64) for academy matches, and  $6 \pm 3$  (range: 1–14) for scholarship matches. Players who were replacements but played zero minutes ( $n = 18$ ) were excluded from analysis. Following the clustering analysis work of Dalton-Barron et al. (2022) players were split into three positional groups: Forward (props, loose forwards, second-rows, hookers); Halves (scrum halves, stand-offs); or Outside Backs (wings, centres, full backs). This grouping resulted in the following sample sizes for match observations: Forwards (senior,  $n = 917$ ; academy,  $n = 625$ ; scholarship,  $n = 237$ ), Halves (senior,  $n = 197$ ; academy,  $n = 170$ ; scholarship,  $n = 64$ ), and Outside Backs (senior,  $n = 489$ ; academy,  $n = 373$ ; scholarship,  $n = 123$ ).

The senior team won 50% of their matches over this period, with an average score margin of  $0.6 \pm 19.7$ . The academy team won 67% of their matches, with an average score margin of  $11.5 \pm 25.9$ . The scholarship team won 83% of their matches with an average score margin of  $24.7 \pm 26.4$ . Institutional ethics approval was obtained, and written informed consent was obtained from all participants.

## **2.1. Match actions**

Each match was either filmed using a Canon xF105 camera and Canon G40 camera or via two video captures from a broadcast feed to provide two angles of the match (close up and wide). The footage was then subsequently coded by two analysts (10 years' and 8 years' experience) on Sportscode version 10 or version 11. Individual match actions were coded to specific operational definitions following recommendations set out by Williams (2012) to insure consistency. Inconsistently defined match actions and match actions that were not used throughout the three competitive seasons (due to club/coach preference variety) were excluded. This resulted in 26 match action characteristics (Supplementary Table S1) reported by match level, opposition, date, match result, score difference, and individual player minutes played. The same analysts coded a game more than twelve months apart to establish intra-rater reliability (range 0.57 to 1.00). Intra-rater reliability was considered excellent on all but one variable, which was considered moderate (Koo & Li, 2016) (Supplementary Table S1).

## 2.2. Data analysis

All statistical analysis was conducted using SAS On Demand for Academics (SAS Institute, Cary, NC). Match observation counts were converted into per minute rate data for analysis to account for the range of minutes played by players across positions and playing levels. To evaluate the differences between match action characteristics across the three levels of the rugby league player pathway (aim 1), and between scholarship or academy players and their progression to professional level (aim 2) linear mixed models were used. Each match action characteristic was added to each model as the dependent variable.

For aim 1, position group, playing level, score margin\*playing level and the position group\*playing level interactions were included as fixed effects. Player ID was included as a random effect. For aim 2, the dataset was split into match observations for each playing level before position group, highest playing level, and the position group\*highest playing level interaction were included as fixed effects. Player ID was included as a random effect. Pairwise differences were used to evaluate the differences in the least square means between the position\*playing level interaction (aim 1) and the position\*highest playing level interaction (aim 2).

For match action characteristics with a normal distribution, general linear mixed models with a Bonferroni adjustment were used. Effect sizes were calculated using Cohen's  $d$  to establish the magnitude of difference: 0.2 = *small*, 0.6 = *moderate*, 1.2 = *large*, 2.0 = *very large*. For non-normally distributed match action variables, generalised linear mixed models, assuming a Poisson distribution were used. Odds Ratio was calculated to determine the odds of a match action count in one group compared to the odds of the count occurring in another group. Statistical significance was set at  $p < 0.05$ .

## 3. Results

### 3.1. Comparison of individual player match action characteristics between scholarship, academy, and senior levels

Statistically significant ( $p < 0.05$ ) differences across the rugby league player pathway for individual player match action characteristics with a normal distribution are shown in [Table 1](#). Thirty-two position\*playing level interactions were significantly different across seven match action characteristics.

Statistically significant ( $p < 0.05$ ) differences across the rugby league player pathway for individual player match action characteristics with a non-normal distribution are shown in [Table 2](#). Sixteen position\*playing level interactions were shown to be significantly different across seven match action characteristics.

Complete results, including match action characteristics with no statistically significant differences considering the position\*playing level interaction are presented in Supplementary Tables S2 and S3.

**Table 1.** Least square means and significant ( $p < 0.05$ ) between group effects relative to position and playing level.

	ESL	Academy	Scholarship	ESL – Aca d(95% CI)	ESL – Sch d(95% CI)	Aca – Sch d(95% CI)
Tackles – Forwards	0.50	0.41	0.35	0.59 <sup>ms</sup> (0.28–0.89)	1.01 <sup>mm</sup> (0.65–1.37)	0.43 <sup>ms</sup> (0.12–0.73)
Tackles – Halves	0.26	0.19	0.18	0.48 <sup>ms</sup> (0.03–0.93)	0.59 <sup>ms</sup> (0.08–1.11)	-
Def PTB Loss – Forwards	0.13	0.07	0.03	1.14 <sup>mm</sup> (0.85–1.44)	1.83 <sup>ll</sup> (1.49–2.17)	0.69 <sup>mm</sup> (0.38–1.00)
Def PTB Loss – Outside Backs	0.050	0.022	0.013	0.52 <sup>ms</sup> (0.18–0.85)	0.69 <sup>mm</sup> (0.29–1.10)	-
Def PTB Loss – Halves	0.069	0.032	0.016	0.70 <sup>mm</sup> (0.24–1.16)	1.01 <sup>mm</sup> (0.48–1.54)	-
Def PTB Win – Forwards	0.107	0.095	0.051	-	1.10 <sup>mm</sup> (0.78–1.43)	0.86 <sup>mm</sup> (0.56–1.16)
Kick Chase – Forwards	0.060	0.024	0.013	0.99 <sup>mm</sup> (0.71–1.28)	1.32 <sup>ll</sup> (0.96–1.65)	0.32 <sup>ms</sup> (0.02–0.63)
Kick Chase – Halves	0.056	0.026	0.012	0.84 <sup>mm</sup> (0.39–1.29)	1.25 <sup>ll</sup> (0.72–1.77)	-
Kick Chase – Outside Backs	0.057	0.033	0.021	0.68 <sup>mm</sup> (0.36–1.01)	1.04 <sup>mm</sup> (0.65–1.44)	0.36 <sup>s</sup> (0.03–0.69)
Carries – Halves	0.20	0.15	0.17	0.52 <sup>s</sup> (0.06–0.98)	-	-
Carries – Outside Backs	0.18	0.15	0.15	0.37 <sup>s</sup> (0.03–0.70)	-	-
Supports – Forwards	0.20	0.14	0.15	0.58 <sup>ms</sup> (0.28–0.88)	0.49 <sup>ms</sup> (0.14–0.85)	-
Supports – Halves	0.24	0.19	0.15	0.47 <sup>s</sup> (0.01–0.92)	0.86 <sup>mm</sup> (0.34–1.38)	-
Supports – Outside Backs	0.22	0.17	0.15	0.44 <sup>ms</sup> (0.11–0.78)	0.59 <sup>ms</sup> (0.19–0.99)	-
Passes – Halves	0.18	0.09	0.07	0.32 <sup>ms</sup> (0.06–0.57)	0.39 <sup>ms</sup> (0.09–0.68)	-

\* $p < 0.01$ , <sup>s</sup>= small effect size, <sup>m</sup>= moderate effect size, <sup>l</sup>= large effect size.

**Table 2.** Least square means and significant ( $p < 0.05$ ) between group effects odds ratio relative to position and playing level.

	ESL	Academy	Scholarship	ESL – Aca OR(95% CI)	ESL – Sch OR(95% CI)	Aca – Sch OR(95% CI)
Defenders Beaten – Forwards	0.023	0.032	0.045	-	1.90* (1.28–2.84)	1.41 (1.02–1.96)
Ineffective Tackle – Forwards	0.028	0.020	0.009	0.72 (0.53–0.97)	0.33* (0.22–0.51)	0.46* (0.30–0.71)
Try Saver – Forwards	0.002	0.004	0.005	2.32 (1.25–4.30)	2.82* (1.38–5.74)	-
Defensive Error – Forwards	0.033	0.018	0.019	0.53* (0.37–0.74)	0.58* (0.39–0.87)	-
Breaks Conceded – Forwards	0.01	0.007	0.006	-	0.58 (0.34–0.99)	-
Tries Conceded – Forwards	0.007	0.009	0.007	1.41* (1.05–1.88)	-	-
Tries Conceded – Halves	0.005	0.01	0.009	1.95* (1.12–3.40)	-	-
Tries Conceded – Outside Backs	0.006	0.01	0.01	1.75* (1.21–2.53)	1.75* (1.03–2.97)	-
Quality Kick – Forwards	0.0005	0.0012	0.0002	2.60* (1.01–6.68)	-	0.19 (0.07–0.51)

\* $p < 0.01$ .



**Table 3.** Least square means and significant ( $p < 0.05$ ) between group effect sizes or odds ratio relative to position and subsequent highest playing level from scholarship matches.

	ESL	Non-ESL	Difference d(95% CI)	Odds Ratio (95% CI)
Metres – Outside Backs	1.99	1.15	0.97 <sup>m</sup> (0.03–1.92)	-
Defender Beaten – Forwards	0.13	0.04	-	3.70* (1.65–8.34)
Defender Beaten – Outside Backs	0.083	0.030	-	2.78 (1.03–7.43)
Line Break – Forwards	0.025	0.006	-	3.98* (1.56–10.15)
Try – Forwards	0.019	0.005	-	4.10* (1.81–9.29)
Try Assist – Forwards	0.0092	0.0023	-	4.03* (1.14–14.21)
Forced Error – Forwards	0.014	0.006	-	2.51 (1.12–5.63)

\* $p < 0.01$ , <sup>s</sup>= small effect size, <sup>m</sup>= moderate effect size, <sup>l</sup>= large effect size.

### **3.2. Comparison of match actions between players that have progressed to professional level and did not**

#### **3.2.1. Scholarship match play**

Statistically significant ( $p < 0.05$ ) differences in individual player match action characteristics in scholarship matches between players who progressed to ESL and those who did not are shown for characteristics with a normal and non-normal distribution in Table 3. In total, seven position\*highest playing level interactions were shown to be significant.

Complete results, including match action characteristics with no statistically significant differences considering the position\*highest playing level interaction are presented in Supplementary Table S4.

#### **3.2.2. Academy match play**

Statistically significant ( $p < 0.05$ ) differences in individual player match action characteristics in academy matches between players who progressed to ESL and those who did not are shown for characteristics with a normal and non-normal distribution in Table 4. In total, eleven position\*highest playing level interactions were shown to be significant.

Complete results, including match action characteristics with no statistically significant differences considering the position\*highest playing level interaction are presented in Supplementary Table S5.

## **4. Discussion**

This was the first study to explore the match characteristics across three levels of the rugby league player pathway in England and retrospectively investigate the match action characteristics of successful rugby league players. The purpose was to determine similarities and differences across the pathway to better inform rugby league player development programmes identification of talent and their preparation of players for progression along the pathway and play in the ESL. To achieve this, the study had two aims: (1) to determine differences in individual

**Table 4.** Least square means and significant ( $p < 0.05$ ) between group effects or odds ratio relative to position and subsequent highest playing level from academy matches.

	ESL	Non-ESL	Difference d(95% CI)	Odds Ratio (95% CI)
Carry – Outside Backs	0.19	0.13	0.81 <sup>*m</sup> (0.21–1.40)	-
Metres – Halves	1.50	0.94	0.79 <sup>m</sup> (0.16–1.41)	-
Metres – Outside Backs	1.72	1.14	0.76 <sup>*m</sup> (0.01–1.50)	-
Defender Beaten – Halves	0.058	0.018	-	3.20* (1.63–6.29)
Line Break – Forwards	0.0074	0.0043	-	1.72 (1.08–2.72)
Line Break – Halves	0.013	0.004	-	3.20* (1.46–7.02)
Line Break Assist – Outside Backs	0.0029	0.0008	-	3.62 (1.19–11.07)
Positive Offload – Halves	0.012	0.0009	-	3.89* (1.19–12.73)
Positive Offload – Outside Backs	0.0064	0.0021	-	3.11 (1.02–9.51)
Complete Pass – Forwards	0.22	0.46	-0.73 <sup>m</sup> (-1.41–0.05)	-
Kick – Forwards	0.0023	0.0003	-	6.71 (1.17–38.53)

\* $p < 0.01$ , <sup>s</sup>= small effect size, <sup>m</sup>= moderate effect size, <sup>l</sup>= large effect size.

player match action characteristics between scholarship, academy, and senior levels of the ESL rugby league player pathway, and (2) compare match action characteristics between players that progressed to the professional ESL level and those who did not.

Regarding the first aim of this study, there were 48 match actions with significant differences when accounting for playing position between competition standard, indicating differences in the match action characteristics between the playing levels. Over seventy percent of the match characteristic differences were defensive match actions, with some *moderate* to *large* effect sizes between senior and both academy and scholarship matches. In effect these results suggest that as the playing pathway progresses from scholarship to senior, players are expected to perform more defensive actions, consistent with previous research (Dempsey et al., 2018; Woods et al., 2018). Forwards completed on average 12 tackles more per 80 minutes played at senior level compared to scholarship matches (40 vs. 28, 42% higher, respectively). Senior forwards also had significantly more defensive play the ball losses (10.4 vs. 2.6, 294% higher), defensive errors (2.6 vs. 1.5, 74% higher), ineffective tackles (2.24 vs. 0.72, 211% higher), and breaks conceded (0.8 vs. 0.48, 67% higher). Interestingly, these increases are all at a higher percentage to the number of tackles made, indicating they may not only be due to volume but also a higher quality attacking opposition, relative to competition level, compared to academy and scholarship match play. This supports the work of Whitehead et al. (2020) who found defensive play the ball losses alone had the highest classification rate between senior and academy forwards, with 90% of match observations with greater than 5 defensive play the ball losses occurring in senior match-play.

One explanation for the differences in defensive match characteristics is likely the score margin (i.e. senior =  $0.6 \pm 19.7$ ; Academy =  $11.5 \pm 25.9$ ; Scholarship =  $24.7 \pm 26.4$ ). These score margins indicate a larger difference in competition between the playing levels with scholarship players facing relatively weaker opponents than senior players. This would also result in less ball in play time and is something to consider for both schedule makers and coaches for long-term planning for scholarship players. With scholarship teams playing only eight matches a year, fixture scheduling should aim to create more competitive matches by matching ability levels to prepare players for the increased demands further along the pathway. For the sake of long-term player development, coaches should also take this into account when designing training practices to allow players to have greater exposure to elements of match play junior players might not be experiencing as frequently in competitive fixtures.

Interestingly, although scholarship matches had considerably higher positive score margins than senior matches and senior players seem to be exposed to more defensive actions, there were few significant differences in attacking match action characteristics between senior and scholarship players (most reporting *small* effect sizes). The biggest difference between the levels was in the number of defenders beaten when carrying the ball, with scholarship players accumulating a higher rate than senior players. To some extent, this supports the observations of Woods et al. (2018) who found players had more defenders beaten at the lower playing level. The capability to beat more defenders at scholarship level suggests that the capability of defenders to “read” the movements of direct opponents and/or the game (i.e. pattern recognition) or make effective tackles are skills that are currently acquired relatively later in players development than the capability to evade a tackle. Interestingly, the number of defenders beaten was reported as significant for both aims of the study. Gabbett and Abernethy (2012) highlighted the importance of deceptive or evasive manoeuvres to beat defenders in scoring tries. However, there although some research into the types of evasive manoeuvres made by different levels of players (Pearce et al., 2020), there is little research suggesting defenders beaten being a key performance indicator in successful performances. Future research could look to explore this match action further.

Half backs in senior matches passed the ball more per game than in both academy and scholarship matches, they also made more carries than in academy matches, indicating that senior halves receive the ball more often, potentially look to be more assertive, have a greater organisation of the team, and have a greater “game sense”; all cited by Cupples and O’Connor (2011) as important performance indicators for half backs and something it might take time and exposure for younger half backs to develop.

The second aim of this study was to determine differences in match action characteristics between players that have progressed on to play ESL and those who did not. There were seven match actions from scholarship match play, and eleven from academy match play that were shown to be significantly different. Players who went on to play in the ESL had significantly higher rates than the players who had not progressed to play in the ESL in all but one of these variables – forwards made relatively more passes at the academy level. There were slightly more characteristics that produced significant results from academy match play, which could be due to the larger sample size of players going on to play in ESL when compared to scholarship match play or the larger sample of matches.

All but one of the significant differences in match action characteristics found were offensive rather than defensive.

Attacking qualities (line breaks, tries, try assists, and defenders beaten) in scholarship forwards were all statistically significantly higher for players that went on to play in the ESL. This indicates attacking play as being an important component of the game when looking to identify elite players in that position from that level on the pathway. Although for study aim one, forwards had greater demands defensively in the ESL, this does not appear to be a significant factor in determining progression from the scholarship level. Outside backs who went on to play in the ESL made relatively more metres carrying the ball at both the academy and scholarship levels. This supports previous research; making metres has often been shown as an important component of success in match play (Gabbett, 2014; Kempton et al., 2015; Parmar et al., 2018).

It is of interest to note the differences between the results associated with each study aims. Over seventy percent of significant differences for aim one were defensive match actions, whereas for aim two, all but one of the significant differences were attacking match actions. One factor to consider regarding this discrepancy could be that the players progressing to the ESL have superior attacking skills which place a greater defensive demand on players in the ESL, highlighted by the higher number of defensive play the ball losses and defensive errors in ESL match play. This difference could also suggest that some of the attacking match actions identified are more difficult to develop within junior athletes and although the defensive elements of the game are more demanding at the senior level, with appropriate development plans and exposure, players can meet these demands. This also suggests that there are limited differences defensively between players that progress to the ESL and those who do not. Therefore, it appears that it is important for players to demonstrate more advanced skill in attack to make the progression.

Although this study is the first to compare match actions characteristics across the three levels of the rugby league player pathway retrospectively over a three-year period, it is not without its limitations. Other studies have included integrated physical data from global positioning systems (GPS) to gain a greater understanding of match actions demands and could be included in future work. Physical characteristics of the players should also be considered when looking to identify and develop talent (McCormack et al., 2020). This could be integrated into future research. The external validity of the findings might be limited by the data being collected from only one club due to possible potential selection biases and tactical preferences. A greater understanding of the best performing teams in the ESL would be important to compare against academy and scholarship level match play to inform the development of players on the pathway. Finally, for the second aim of the study, there was only one point of reference (players who played in the ESL), further analysis could be done to establish whether there were any significant differences between other highest playing levels achieved, such as international level.

In conclusion, this study demonstrates that there are differences in match action characteristics between the three levels of the rugby league player pathway. The senior competition demonstrated a higher defensive match action demand, particularly for forwards, than at the academy and scholarship levels. However, when exploring the match action characteristics in academy and scholarship players who have subsequently progressed to ESL, a higher rate of attacking match actions were observed. These findings suggest the identification of attacking skills and the development of

defensive skills are vital for player progression along the rugby league player pathway. Stakeholders could use these results to both help identify and develop players the rugby league player pathway through training practices and long-term athlete development plans specific to their positions. The results of this study suggest that when looking to identify players to progress to play in the ESL, judging attacking qualities should be an important component of the evaluation process. Coaches should also still look to incorporate this attacking skill development into players training plans to give them a better chance of progressing to the ESL. Stakeholders in talent development should be including training practices to expose players to the increased defensive demands in the ESL in preparation for them progressing on the player pathway.

#### **4.1. Practical applications**

- Fixture schedules should be implemented to create more parity in playing ability in matches at the scholarship level to better simulate match action demands at higher levels of the player pathway to aid development.
- Regarding talent identification, attacking match actions, such as, metres made, defenders beaten, and line breaks should be strongly considered when looking to identify talent from scholarship and academy rugby league to play in the ESL.
- Coaches and stakeholders with a focus on talent development at the scholarship and academy levels should be aware of the increased defensive match action demands at the senior level and look to integrate this into their training practices.

#### **Acknowledgements**

The authors thank the club involved for their assistance on this research study.

#### **Disclosure statement**

No potential conflict of interest was reported by the author(s).

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