# Relative Age Effects in Welsh Age Grade Rugby Union

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**ABSTRACT**

Relative age effect (RAE) refers to the immediate and long-term consequences of age difference within an age grouping. In sporting contexts, it has been widely shown that those born in the first quarter gain an advantage over those born in the last quarter of the year. Rugby union has received scant attention in relation to RAE. The primary purpose of the present study was to examine the presence and prevalence of RAE in Welsh age grade Rugby Union. A further purpose was to consider how coaches' selection processes have the potential to contribute to the manifestation of RAE. A sequential multi-method research typology was adopted to gain a richer, more contextualized understanding of RAE. Results revealed that RAE was evident in all age groups of Welsh junior club rugby from 'Under 7-19 yrs'. Odds ratios showed that the magnitude of the RAE increases with the three levels of performance (district, regional and national) above the club game. Further, the process of selection had characteristics that increased the risk of RAE occurring, especially a propensity to use physical characteristics as the primary selection criteria when selecting for representative teams. Also, coaches over emphasis on game performance and winning appeared to determine that the older, potentially bigger, faster, stronger players are preferred over the younger less physically mature players.

**Key words:** Relative Age Effects, Rugby Union, Selection

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**INTRODUCTION**

Rugby Union is a popular male participation sport in Wales, with total playing numbers exceeding 50,000; 30,000 of those are under 19 years of age. The Welsh Rugby Union (WRU) organizes its age group players around an August 31st cut-off date in any year, in line with the education system's academic year. Representative teams begin at under 11 years of age (U'11) and continue at each age group to under 18 years of age (U'18). Welsh male rugby union would, therefore, appear to possess the necessary propagating conditions (popular male team sport, established talent development pathway and high competition for places) that increase the risk of relative age effect (RAE) bias occurring [1]. Like many other sports, rugby in Wales is subject to a decline in playing numbers with increasing age. The sport loses 32% of its participants between 13 and 19 years of age [2].

RAE refers to the immediate and long-term consequences of relative age difference between those within an age grouping [1]. In both the educational [3, 4] and sporting [5, 6] contexts it has been widely shown that those born in the first quarter gain an advantage over those born in the last quarter of the year. These advantages include being more physically developed (taller, heavier, faster and stronger) and, therefore, possessing a greater propensity to perform than their younger peers in physical activities [7]. In addition, other advantages linked to short-term maturational differences such as enhanced cognitive and social development have been suggested that also assist the older players to outperform their younger peers [8].

Rugby Union has received scant attention in relation to the presence and prevalence of RAE. Also, acknowledging previous research directions in this area, the present study aimed to not merely establish the presence or otherwise of RAE in Welsh Rugby Union using quantitative analysis but to go further and use an additional qualitative approach to consider the affect that the selection of players by coaches might have on RAE, thus making this a distinctive addition to the research in the area.

RAE has been studied extensively in a variety of sports [e.g., 9, 10, 11] Musch and Grondin's [12] review of RAE identified 35 separate studies across sports with a predominance of research in soccer and ice hockey. Further, Cobley *et al.* [1] in their meta-analytical review of RAE research identified 38 studies in 14 different sports across 16 countries that had identified the presence of RAE. Results from these studies broadly emphasised that the strongest and most consistent RAE is identified in male sports and that those born closest to the start of the selection year are over-represented within the higher representative levels of that sport. Baker *et al.* [5] proposed that a sports' popularity and competition infrastructure provide the propagating conditions that perpetuate RAE. Consistent with this, Musch and Grondin [12] propose that the strength of RAE is dependent on the depth of competition for places in teams in talent development programmes, created in popular sports. Further, Barnsley and Thompson [13], Deaner *et al.* [14] and Sherar *et al.* [15], all provide support for the notion that competition for places, particularly at the higher levels of talent identification infrastructures, increases the risk of RAE bias.  RAE has also been shown to contribute to drop out from sport [16]

Physical performance is related to biological maturation. Philippaerts *et al.* [7] and Musch and Grondin [12], note that a greater chronological age increases the likelihood of more advanced physical characteristics being primarily responsible for RAE. In sports, like rugby, where body size, strength and power provide an advantage, RAE is likely to be more prevalent [17]. Martindale *et al.* [18] identified that many talent development systems use current performance measures as the main indicators of talent, when talent should be measured by future potential. Vaeyens *et al.* [19] support this view, noting that talent development systems over emphasise measures that are positively influenced by maturational factors. They suggest that, as a result, a large number of current talent development models are likely to exclude many, especially  late maturing athletes

To date, the investigation by Till *et al.* [17] represents the most detailed study of RAE in rugby across either code (union and league) of the game. Their

results revealed that RAE was present across all male age groups from as early as U'7. Further, they demonstrated that between levels of performance the RAE is magnified at each successive level of representation in the U'13 to U'15 age groups. The significant magnification of this asymmetry with successive levels of performance suggests that other factors, such as player selection processes, might be contributing to the RAE observed.

Similarly, other recent research into RAE has begun to shift the focus away from merely establishing the existence (or non-existence) of RAE in particular sports, to seeking to understand the factors that contribute to that existence [e.g., 20, 21, 22]. Player selection has been identified as a potential influence on RAE, but to date, there is a lack of research that has investigated the nature of coach selection behavior that propagates RAE [5].

Given the early maturational explanation offered as one of the underlying process of RAE [23], and the physical requirements of Rugby Union, it is possible that coaches involved in the selection of players will use measures, or be influenced by factors, that have a positive relationship with early maturation. The implications for rugby in Wales are significant. As Vaeyens *et al.* [24] noted, such practices might provide the early born with enhanced selection opportunities but, conversely, their younger counterparts will receive a less positive experience, which ultimately might lead to the youngest in the age group dropping out.

**METHODS**

RESEARCH DESIGN

A sequential multi-method typology was adopted to gain a richer, more contextualized understanding of RAE [25, 26]. Such a typology is particularly useful when a researcher implements both quantitative and qualitative strands in distinct sequential order [26]. In the present study, the quantitative strand firstly examined the presence and extent of RAE in age grade rugby in Wales. The qualitative strand that followed sought to provide a level of insight into the processes that might promote RAE.

QUANTITATIVE PHASE

Participants

The quantitative phase accessed data for 98% of the whole population being studied. Welsh rugby's player development pathway (see Figure 1) is organised by both age group and level of competition and the present study sampled a total of 34,788 rugby players from within that pathway.

**Insert Figure 1**

Procedures

To measure the relative age distribution in Rugby Union players in Wales, the study required an expected distribution for the wider population of similarly aged males, to be used as a comparison. National statistics provided birth data, for males only, for the years 1993 to 2003 inclusive, which correspond to the year of birth of players in the club and representative teams in the study.

Following ethical approval from the research ethics sub-committee of the Cardiff School of Sport and consent from the WRU, the WRU internal registration system known as 'MyWRU' provided information on all club registered players in the U'7 to U'19 age groups for the 2011/2012 playing season. Additionally, data from the U'12 to U'16 district, regional and national cohorts was collected for the 2011/12 and 2012/13 seasons from WRU district and regional squad databases. The MyWRU system  and district databases provided data on players containing only details of their date of birth (DOB).

Data were categorised into relative age quartiles: quartile one (Q1) = September 1$^{st}$ to November 30$^{th}$; quartile two (Q2) = December 1$^{st}$ to February 28$^{th}$; quartile three (Q3) = March 1$^{st}$ to May 31$^{st}$; and quartile four (Q4) = June 1$^{st}$ to August 31$^{st}$ (see Table 1). The percentage of births for each quartile was calculated from the births within the sample. The relative age in the registered U'7-U'19 club players' sample was compared to the expected relative age distribution drawn from national statistics [27, 3].  To address the district, regional and national representative teams, the relative age distribution of the club players sample was

then used to compare the expected distribution with the observed birth distributions of the representative players [28].


**Insert Table 1**


QUANTITATIVE DATA ANALYSIS

A chi-square test ($\chi^2$) for goodness-of-fit was used to analyse the data and an odds ratio test (OR) was used to compare the odds of a player born in Q1, Q2 or Q3 to the odds of a player born in Q4 being selected. The ORs provide an indication as to the whether direction of the relative age distributions differed from the expected distributions.


QUALITATIVE PHASE

Participants

The qualitative strand of the study adopted a purposive sampling strategy to explore the selection processes employed by coaches for representative age group teams. To investigate the impact that selection might have on RAE [29]. The sample for this phase was drawn from three levels of competition (district, regional and national). Twenty development officers who met the studies selection criteria of having held coaching roles with a district team or regional team over the two seasons before the start of the study (14 worked at district level exclusively, whilst six had worked at both district and regional levels) agreed to participate in the study. In addition, six coaches of a national age group squad agreed to participate,


Procedures

All participant coaches were provided with a letter detailing the nature of the study, the research design and how the results were going to be used [30]. The principal researcher confirmed the anonymity and confidentiality of the participants and

informed them of their right to withdraw at any time. All agreed to participate, providing written informed consent.

Coaches were told that they would be participating in a focus group discussion about selection of players to representative teams. Focus groups were adopted as the medium for this discussion as they serve to extend thinking about a particular issue [31]. Furthermore, Bloor *et al.* [32] note that focus groups have a role in shared understanding, both revealing shared values and identifying difficulties with such norms. It was felt, therefore, that focus groups would be the most effective method for exploring the shared difficulties of selection in relation to the norms of expectation on the coaches. No reference was made to RAE in any of the documentation or verbal explanation given to the participants before or during the focus group meetings. All coaches therefore entered the focus groups blind to the study intentions.

Three separate focus groups explored the coaches' shared knowledge and experience around the selection of players [33]. Each focus group was planned for 90 minutes duration and was held in a relaxed familiar setting. The national squad coaches ($n$ = 6), formed the first group, with the development officers groups forming the second, ($n$ = 6) and third ($n$ = 14) focus groups. The total sample represented 37% of the coaches working at district, regional, and national level in Wales.

A series of questions was developed that followed the classic 'funnel structure' of broad open-ended questions before shifting toward narrower more focused questions [34, 30]. The questioning route was structured around 12 questions, organized into five categories (opening questions, introductory questions, transition questions, key questions and ending questions) with the 'key questions' having the highest level of importance and therefore receiving the greatest amount of time and intensity of analysis. Examples of key questions asked – '*List the key characteristics you look for in a player*' '*What processes do you use to select players?*' '*Do you use different criteria for selection of players to different positions?*' '*Discuss how important player size was in your selection decision*' '*What are your measures of success with this team?*'

Data collection took the form of audio recording of every focus group which, was then fully transcribed. The participants were subsequently presented with a copy of the transcript and asked to check for accuracy [30]. All participants subsequently confirmed the accuracy of the transcripts.

Data Analyses

A constant comparative framework was adopted to analyse the transcribed data whilst adopting an open coding approach [30]. Each transcript was read line-by-line, to identify 'meaning units' which, using a thematic analysis approach, were organized around the principle questions [36]. Meaning units were grouped into sub-themes and assigned a label that best described them. All sub-themes were then extracted and theme labels developed. In the final data reduction, categories were created that subsumed all themes, sub-themes and meaning units. These categories were checked and agreed upon by all members of the research team.

**RESULTS**

QUANTITATIVE ANALYSIS

Club Registered Players

For the national statistics on male births, a 31st August cut-off point produced the following relative age distribution represented in quartiles: Q1 = 25%, Q2 = 24%, Q3 = 25%, and Q4 = 26%. This distribution provided the expected distribution for comparison with the observed club registered player population reported in Figure 2. The club player (combined) relative age distribution was calculated from all club registrations (U'7 to U'19) and showed the distribution to be: Q1 = 29%, Q2 = 26%, Q3 = 23%, Q4 = 22% for the club playing population (see Table 2).

**Insert Figure 2**

**Insert Table 2**

Chi-square goodness-of-fit results showed that the relative age distribution in club registered players (combined) was not equal to the all-Wales male population: $\chi^2$ = 489.7 (df = 3, $n$ = 32485), $P$ < 0.001. Table 2 shows the relative age distribution in quartiles (Q1-Q4), $\chi^2$ and OR for all male club registered players (U'7 to U'19). Chi-square analyses revealed statistically significant ($P$ < 0.05) differences between the observed and expected distributions in every age group from U'7 to U'19 club players.

There was an asymmetry to the distribution of the births in the club playing population in favour of those born closer to the September 1st start of season date. Significant OR (95% CI) were found at all age groups (U'7 to U'19) for Q1 v Q4, Q2 v Q4 and Q3 v Q4. A comparison of relative age distribution (Figure 2) showed a clear and significant ($P$ < 0.05) over-representation of those born earlier in the year.

Representative Players

Chi-square goodness-of-fit test results showed that the relative age distributions in representative age grade players was not equal to the club registered players at the three performance levels above club rugby: district level $\chi^2$ = 93.25 [df = 3, $n$ = 2022], $P$ < 0.001; regional level U'16* $\chi^2$ = 3.91 [df = 3, $n$ = 47], $P$ < 0.050 and U'16** $\chi^2$ = 54.01 [df = 3, $n$ = 191], $P$ < 0.001 and national level NAG U'16* $\chi^2$ = 16.96 [df = 3, $n$ = 43], $P$ < 0.001) and NAG U'16** $\chi^2$ = 24.46 [df = 3, $n$ = 48], $P$ < 0.001)

Table 2 shows the relative age distribution in quartiles (Q1-Q4), and ORs for district, regional age grade (RAG) and national age grade (NAG) representative teams. Chi-square analyses reveal statistically significant differences between the observed and expected relative age distributions for all age groups and at all performance levels ($P$ < 0.05 levels). In regional age grade and national age grade squads, players born in the first half of the year account for 71.7% and 79.8% of the total squads compared to an expected level of 55%.

Odds ratio statistics showed that at all age groups and at all performance levels those born in Q1, Q2 and Q3 were over-represented compared to those born in Q4. Further, the magnitude of this difference increased with level of performance (see Figure 3). Indeed, this culminated at national age group level where the odds of a Q1 born player being selected are eleven times the odds of a Q4 born player being selected to the U'16 national squad.(Q1 v Q4 OR: 11.96, 95% CI: 3.87 to 36.97)

**Insert Figure 3.**

QUALITATIVE ANALYSIS

The thematic analysis created 160 individual meaning units that produced 142 sub-theme items. These in turn were reduced to 16 broader themes (see Figure 4), leading to the emergence of three categories:

- The criteria adopted by coaches
- The process adopted by coaches
- The context in which decisions are made

The 'criteria adopted by coaches' category was made up of 41% of the meaning units, with the 'process' and 'context' categories accounting for 33% and 26% respectively.

During the thematic coding the principal researcher attempted to adopt an unbiased position, but it is accepted that preconceived views were difficult to fully eliminate from the analysis. It is also acknowledged that the principal researcher had 16 years of experience working with the players and coaches of the age groups in question and that this experience added to the richness of detail in the qualitative enquiry. Findings should, therefore, be viewed in this context.

**Insert Figure 4.**

Criteria Used in Selection

The selection criteria used by coaches often focused on the most obvious physical characteristics of a player, as exemplified by one RAG coach:

*"If you have 30 players lined up and you'd never seen them play and never seen them train, and we all had to pick a team, the 3ft 2in bloke isn't going to get picked by any of us and he might be the best player there!"*

Similarly, at district representative level a number of coaches commented on physical size as the first priority, e.g., '*Oh, he's a big lump!*' and then considering other physical attributes, e.g., '*Can he move?*' '*Can he run?*' thus suggesting that: '*The person you have your eye on first of all is the person who stands head and shoulders above the rest.*' This reflects the influence that permeates age grade rugby from those further up the pathway to provide the right sort of players required to service the professional game. In the words of one NAG coach: '*In the high performance game, what counts is bigger, faster, stronger.*'

Physical characteristics, however, were not the only criteria identified by coaches in their selection process. In particular, the personal qualities such as 'open mindedness', 'work ethic' and 'overall coachability' were also noted as being important criteria when selecting players. Interestingly, however, the comments about such qualities were more evident at the lower levels of the pathway (district) where there was clearly a more holistic approach to the engagement of players.

In some instances, development coaches perceived that players were not going to make it any further in the game. They felt therefore that the opportunity to play representative rugby was going to be the pinnacle of the player's attainment, which was consequently used to justify their selection. This raises some questions about coach expectations and how they could possibly know this. Indeed, the notion of future potential was a difficult concept for them to grasp, regardless of performance. At the district level there was a greater awareness of the need to keep as many players involved as possible. Coaches working at regional and national levels felt that they were measured more by immediate results, such as match outcomes, rather than by longer-term measures such as the number of

players they produced who progressed to full international level. Consequently, the coaches at national age grade felt that picking the best players based on their immediate (current) performances was the only acceptable approach to the most important games, e.g.*: 'I think the players will expect that we will pick what we perceive to be the guys who are most likely to perform best for us.'*

Across all levels future potential was dealt with by referencing the selection of players who already possessed the necessary size criteria to make it at the highest level. Thus, by selecting them now they felt they were selecting for longer-term potential. Taking a long-term view on players who did not possess any obvious standout physical qualities was a more difficult concept for coaches at all levels. However, as already identified, there appeared to be a greater openness to selection, based on future potential at district level (compared to regional and national levels):

> *There are players there who, given a couple of years, could make very good players and they're the ones I'm bothered about.  I'm not bothered about the ones I send to the region, because we know that at this moment in time, they've peaked*                                (District coach).

Thus, game performances provided the main measures for coaches at all levels in the player pathway. It was difficult for coaches to select against predictions of future ability based on more intangible indices such as game understanding, or future potential size, if those traits were not being exhibited at that particular time. In the words of one regional coach: *'This future potential thing, that's just a fluffy statement, isn't it?  Who can gauge the potential of any individual; there are so many potential impacting factors.'*

Processes Used in Selection

The themes emerging from this category suggest that there was no overarching framework to shape and inform selection decisions of the coaches at all levels. Even within coaching groups there was very little agreement on what each coach

should be looking for in a player. As one national coach admitted: *'I feel almost embarrassed that we haven't ever sat down as selectors at the start of the process and said: "This is what we're looking for in a player".'*

Selection of players, therefore, appears to be a personal process based predominantly on the past experience of that coach regardless of the level at which they coach. A shared mental image of the player required did not exist within this group of coaches at any of the levels. Selection decisions were individualized, typically based on personal experience, understanding or preference. In the words of one of the national coaches: *'When it comes to the end when everyone looks at each other and says "Right, we have to make a decision", then you have to go with whatever is in your gut.'* Indeed among this group of coaches, it was suggested that creating criteria could confuse the process of selection: *'If you put a standard down, e.g. "this is what we're looking at, as a scrum-half or as a hooker," you'd contradict yourself from day one.'*

In terms of selection processes, a hierarchical system seemed to exist within this group of age grade coaches, with the head coach/es having the first selection and ultimately the final say. As one national coach put it*: 'I think there is a lot of respect within the group even though there are tiers within it. There's the Forwards Head Coach and a Backs Head Coach and they lead the way on it* (selection)'.

The focus groups revealed that the majority of selection decisions were made through game observations. Only at the lowest level (district) was there any opportunity to study players' personal characteristics in an extended training environment. Interestingly, coaches noted that training situations allowed them to learn more about the personal characteristics of the player, e.g.*, 'If I'm coaching on a Wednesday night with the district U'14s, their ability level doesn't really worry me, but whether or not they listen, participate and give it 100%, does.'*

Contexts in Which Selection Occurs
At district, regional and national levels the pathway is centred on competitions and as such there is the additional pressure on coaches to win within those

competitions. Competition therefore has an influence on the criteria used to select players and the process of selection used by coaches. As stated by a district coach:

> *As for the team I want to see success, I want to win.  If we're going to compete in a tournament, then we've got to do the best we possibly can with the players we've got.  If every player goes out there, gives 100% and we lose I can live with that, that's not a problem, but I do want to do well in the tournaments.* *(District coach)*

At regional level, one coach identified the conflict between combining competitions and development, suggesting that: *'The structures of the competitions don't necessarily allow that development process to happen as well as it could.'* However, at national level one coach offered an alternate view and felt that development and winning can potentially sit alongside one another, whilst still acknowledging the importance of winning for both the players and the coaches:

> *We don't just select the 46 who are going to win every game, we also select with a view to developing players.  But as the competitions and tournaments progress, winning definitely does become more important. We've won three matches now, and we are keen to continue the momentum that we've created because it builds confidence, it builds team spirit and makes everything a lot easier for all of us.* *(National coach)*

A fellow coach in the same national squad supported this view by stating that: *'The win element is huge in the development. I don't think they can be segregated, they're massively together.'* However, he also acknowledged the insecurity of his own position and the need to win games*: 'I definitely think, as coaches, we are well aware of being judged ultimately on performances and results.'*

The competition-focused nature of the player pathway, therefore, created a tension for coaches in balancing longer-term player development approaches against the realities of being in a competition, where the currency of success is measured by win-loss ratios. Indeed, the results suggest that everything else is second to the exigencies of winning immediate competitions and that coaches, particularly at national level, feel they are judged on the win-loss success of their teams. Such a situation would appear to encourage coaches to compromise their longer-term aims in favour of short-term wins. Within this context there is an increased likelihood of the bigger, faster, stronger players being selected ahead of the longer-term prospect. Selecting the 'best players at this moment' appeared to be an easily defendable position for the coaches, for their players and for the players' parents, compared to the alternative of selection based on less tangible criteria, such as future potential.

## DISCUSSION

### RAE AND CLUB RUGBY

Findings from the present study demonstrated that RAE was evident in all age groups of Welsh junior club rugby from U'7 to U'19. The analysis confirmed and supported the notion that the risk of RAE inequality increased as a player's birth date moved away from the September 1$^{st}$ annual cut-off date for each age group. The results revealed that for every age group (with the exception of U'8's) both the Q1 and Q2 born players were over-represented in club teams compared to Q4 born players. In the U'8's only the Q1 born players were over represented.

These findings are consistent with a number of studies whose focus was the presence of RAE in age grade teams [37, 15, 17]. Contrary to previous suggestions by Barnsley and Thompson [13] that older age groups are potentially more at risk of RAE, the present study found no difference in the risk of RAE between the younger and older age groups from U'7 to U'19 in the club game. There was no consistent pattern of increased incidence of RAE across club registered players during adolescence compared to younger age groups.

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Consistent with the findings of Delorme and Raspaud [38] and of Hancock *et al.* [39], RAE was identified in the youngest age groups (U'7 and U'8) of Welsh rugby where formal competition opportunities are limited. Musch and Grondin [12] have suggested that lack of formal competition at the youngest age groups should negate the risk of RAE developing as there is less internal competition for places within a team.  It is particularly surprising in the context of Welsh rugby to find RAE at such young age groups, as the game played at the U'7 and U'8 age groups is a non-contact modified version of the game, where the advantages of physical size are significantly reduced. The suggestion made by Hancock *et al.* [39] that parents' make participation choices on behalf of their children and as a result smaller, younger players might not be offered the opportunity to play rugby, may explain this finding. This results in RAE patterns being present in even the youngest age groups.

RAE AND REPRESENTATIVE RUGBY

The present study demonstrated that RAE was evident in all age groups from U'12 to U'16. The findings showed significant differences between the expected relative age distribution of the club registered players and the observed relative age distribution frequency of age grade representative players. More substantial, however, was the finding that RAE increased with each and every performance level within age grade rugby. RAE at district level increased at regional level and climbed further at national level. The odds of an U'16 player born in June, July or August were eleven times less likely to represent Wales at U'16 level compared to the odds of a player born between September and November in the same selection year. Till *et al.* [17] noted a similar pattern in rugby league and suggested that this emphasized the processes associated with player performance evaluation, assessment and selection as key causal mechanisms leading to heightened RAE. The increasing difference between the RAE found at regional and national level cannot simply be the mimetic expression of the critical mass of registered club players [11], but must be influenced by other factors related to the process of moving between levels of performance. The current quantitative findings,

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therefore, adheres to the Cobley et al's maturation-selection hypothesis that selection processes contribute to this increased RAE [1]. The qualitative evidence on coaches' selection processes also provides further confirmation.

RAE AND COACH SELECTION BEHAVIOUR

The present study offers a level of insight into the processes of selection that previous studies on RAE have not provided [e.g., 17, 39]. The findings confirm that the process of selection that occurs in Welsh age grade teams have a number of characteristics that increase the risk of RAE occurring. Coaches placed a heightened emphasis on the importance of physical size, which favours the early born player. This emphasis was more prevalent the higher up the developmental pathway a player progresses. Coaches' comments at regional and national level reflect an increased awareness of the demand on them to identify and develop bigger, faster and indeed more skilful players. There is a widely held belief that the professional game demands players of a particular physical size and shape. Such a view is at odds with current research.  Martindale *et al*. [18] identified this as a weakness in many current talent development systems that created a bias towards the bigger, older player. Further, Vaeyens *et al*. [19] note this uni-dimensional approach is often adopted in team sports' talent development models that concentrate on anthropometric, physical, or physiological measures even though their value has proven problematic.

Cobley *et al.* [1] note that numerous studies identify physical differences as being primarily responsible for RAE. The qualitative analysis findings in the present study show a propensity in coaches to use physical characteristics as the primary selection criteria when selecting players to age grade teams. It would appear that the value placed on size by coaches rather than size itself that drives the trend towards bigger (older) players. This finding answers the question posed by Helsen *et al.* [40] in regard to the criteria used by coaches to discover talent. Helsen *et al.* [40] recognized that coaches' assessment of talent was heavily weighted in terms of physical maturation, not skill, or team play. Clearly, Welsh coaches' vision of talented players might be biased by temporary differences in growth and

maturation. Selection based around size that is a product of advanced physical maturation clearly will exclude a proportion of the playing population in Wales [41]. Given the relatively small playing base of Welsh rugby, the long-term implications could be significant.

In rugby, as in many other sports, winning appears to define a good coach and remains the currency by which coaches are measured. Coaches with ambition to progress clearly feel pressure to demonstrate competency through winning. It must be questioned whether such aspiring coaches are best suited to coach in talent development programmes; their dependency on short-term successes might be at odds with the long-term ambitions of the talent development programmes in which they work.

The desire to win was also identified as a positive trait to develop in players. Therefore, assisting players to win in pressured competition environments was viewed as developmental, as it prepared players for those situations in the future. A fundamental flaw in such thinking is that it assumes that those players currently involved will go on to become the elite players of the future. Meylan *et al.* [42] note that physical advantages afforded as a result of advanced age or maturity during adolescence are largely transient and are reduced, or reversed in young adulthood, a trend that has recently been shown in rugby league players [43, 44, 45].

Martindale *et al.* [18, p354] talk of the 'systematic consideration of long term aims and methods, wide ranging coherent messages and support and emphasis on appropriate development rather than early selection', as crucial elements in a successful talent development structures. Whilst Welsh rugby has a well defined structure and long-term view on its requirements (coaches knew what was required at the end), there remains a real inconsistency in the coherent wide-ranging messages and appropriate development required to deliver those requirements. Comments made by coaches would appear to indicate that decisions on players are not made as part of a long-term vision, but informed by the experience and 'gut feeling' of individual coaches operating in the moment and in isolation, with an over-emphasis on winning that encourages them to pick on current performance

rather than future potential. Meylan *et. al.* [42] believes that this coach-driven approach, built on intuitive knowledge of socially constructed images of the perfect player can lead to repetitive misconceptions in talent evaluation

STUDY LIMITATIONS AND FUTURE DIRECTIONS

The present study had no mechanism to differentiate between active and inactive player data entries. Whilst the analysis removed duplicate and rogue entries which were not required in the study (such as female entries), it could not eliminate the potential for measuring players who have since stopped playing. Also, the principal researcher's relationship with the coaches might have influenced the responses received to questions in the focus groups, as some of the coaches present were employees working under that researcher. Any potential bias resulting from such relationship should be considered when considering the outcomes of the focus group work.

The present study considered all players as one homogeneous group. A characteristic of rugby is the role differentiation between positions in a team that demand very different physical, skill and cognitive attributes. Future research on RAE in Rugby Union should consider the effect that playing position might have on the presence and magnitude of RAE. Similarly, understanding if a relationship exists between relative age and a player's maturational status would add further support to the assumption that RAE is propagated by advanced physical characteristics associated to maturational advantage. From a coaching perspective translating the notion of developing 'future potential' from a concept to a deliverable process remains a challenge for coaches in talent development pathways.

**CONCLUSIONS**

The results of the study indicate that in Welsh age group Rugby Union an unequal distribution of players exists in favour of those born earliest in the selection year. This pattern of RAE is consistent across all age groups of junior and youth club rugby. At representative levels, the RAE is magnified beyond levels found in clubs

to the extent that other factors such as the processes of selection are thought to impact and increase the risk of RAE. Results from discussions with coaches identified that the criteria used to select players, allied to the accepted processes adopted by coaches to make those decisions, are likely to increase the risk of RAE developing. Further, the context, where players are judged by current performance measures in an environment where an over emphasis is placed on winning, further contribute to the risk of RAE occurring.

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**Table 1:** **Characteristics of the Samples Analysed as Part of the Quantitative Phase of the Study**

| Playing group | Total sample $n$ | Q1$n$ | Q2$n$ | Q3$n$ | Q4$n$ | Mean ± SD age (yrs) |
|---|---|---|---|---|---|---|
| **Registered club players** | 32485 | 9410 | 8361 | 7604 | 7110 | 12.4 ± 2.2 |

| | | Q1 | Q2 | Q3 | Q4 | |
|---|---|---|---|---|---|---|
| **Tier 1 competition (district)** | 2022 | 728 | 566 | 437 | 291 | 14.3 ± 0.3 |
| **Tier 2 competition (regional)** | 238 | 97 | 73 | 35 | 33 | 15.7 ± 0.3 |
| **Tier 3 competition (national)** | 91 | 45 | 28 | 10 | 8 | 15.7 ± 0.3 |
| **Total** | 34788 | 10255 | 8904 | 8081 | 7438 | |

**Key:**  Q1 = Quartile 1, Q2 = Quartile 2, Q3 = Quartile 3 and Q4 = Quartile

**Table 2:** Relative Age Distributions of Welsh Age Group Club and Representative Team Rugby Union Players

| Team | Q1 | | Q2 | | Q3 | | Q4 | | Grand total | $x^2$ (df = 3) | *P*-value | OR (Q1 vs Q4) | 95% CI (Q1 vs Q4) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | total | % | total | % | total | % | total | % | | | | | |
| Club U'7 | 434 | 32.0 | 341 | 25.1 | 315 | 23.2 | 268 | 19.7 | 1358 | 49.3 | 0.001 | 1.91 | 1.61 to 2.26 |
| Club U'8 | 607 | 27.7 | 525 | 24.0 | 511 | 23.3 | 546 | 24.9 | 2189 | 9.9 | 0.050 | 1.16 | 1.01 to 1.32 |
| Club U'9 | 736 | 32.3 | 645 | 28.3 | 307 | 13.5 | 591 | 25.9 | 2279 | 187.3 | 0.001 | 1.36 | 1.21 to 1.54 |
| Club U'10 | 761 | 26.0 | 747 | 25.6 | 731 | 25.0 | 683 | 23.4 | 2922 | 12.0 | 0.010 | 1.15 | 1.03 to 1.30 |
| Club U'11 | 853 | 28.8 | 748 | 25.3 | 689 | 23.3 | 671 | 22.7 | 2961 | 35.4 | 0.001 | 1.38 | 1.23 to 1.55 |
| Club U'12 | 909 | 27.6 | 864 | 26.2 | 826 | 25.1 | 695 | 21.1 | 3294 | 46.1 | 0.001 | 1.43 | 1.28 to 1.59 |
| Club U'13 | 891 | 27.1 | 826 | 25.2 | 834 | 25.4 | 731 | 22.3 | 3282 | 25.7 | 0.001 | 1.30 | 1.17 to 1.45 |
| Club U'14 | 899 | 27.7 | 819 | 25.2 | 817 | 25.2 | 712 | 21.9 | 3247 | 32.1 | 0.001 | 1.36 | 1.22 to 1.52 |
| Club U'15 | 954 | 30.3 | 827 | 26.3 | 754 | 23.9 | 615 | 19.5 | 3150 | 94.1 | 0.001 | 1.79 | 1.60 to 2.00 |
| Club U'16 | 936 | 31.4 | 772 | 25.9 | 672 | 22.6 | 598 | 20.1 | 2978 | 101.0 | 0.001 | 1.82 | 1.63 to 2.05 |
| Club U'17 | 436 | 29.8 | 379 | 25.9 | 355 | 24.2 | 294 | 20.1 | 1464 | 35.6 | 0.001 | 1.69 | 1.43 to 1.99 |
| Club U'18 | 495 | 30.1 | 430 | 26.1 | 358 | 21.7 | 364 | 22.1 | 1647 | 36.5 | 0.001 | 1.52 | 1.30 to 1.76 |
| Club U'19 | 499 | 29.1 | 438 | 25.6 | 435 | 25.4 | 342 | 20.0 | 1714 | 37.5 | 0.001 | 1.65 | 1.41 to 1.92 |
| Club players combined | 9410 | 29.0 | 8361 | 25.7 | 7604 | 23.4 | 7110 | 21.9 | 32485 | 489.7 | 0.001 | 1.45 | 1.41 to 1.51 |

**Table 2 cont.:** **Relative Age Distributions of Welsh Age Group Club and Representative Team Rugby Union Players**

| Team | Q1 | | Q2 | | Q3 | | Q4 | | Grand total | $\chi^2$ (df = 3) | P-value | OR (Q1 vs Q4) | 95% CI (Q1 vs Q4) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | total | % | total | % | total | % | total | % | | | | | |
| Dist U'12 | 190 | 36.1 | 153 | 29.0 | 114 | 21.6 | 70 | 13.3 | 527 | 66.49 | 0.001 | 3.68 | 2.73 to 4.97 |
| Dist U'13 | 118 | 27.7 | 128 | 30.0 | 110 | 25.8 | 70 | 16.4 | 426 | 22.85 | 0.001 | 1.95 | 1.41 to 2.70 |
| Dist U'14 | 188 | 41.4 | 122 | 26.9 | 92 | 20.3 | 52 | 11.5 | 454 | 91.48 | 0.001 | 5.46 | 3.91 to 7.63 |
| Dist U'15 | 176 | 37.3 | 129 | 27.3 | 96 | 20.3 | 71 | 15.0 | 472 | 56.59 | 0.001 | 3.36 | 2.48 to 4.55 |
| Dist U'16 | 56 | 39.2 | 34 | 23.8 | 25 | 17.5 | 28 | 19.6 | 143 | 16.97 | 0.001 | 2.64 | 1.59 to 4.40 |
| District players combined | 728 | 29.0 | 566 | 25.7 | 437 | 23.0 | 291 | 21.9 | 2022 | 93.25 | 0.001 | 3.35 | 2.88 to 3.88 |
| RAG U'16* | 16 | 34.0 | 11 | 23.4 | 13 | 27.7 | 7 | 14.9 | 47 | 3.91 | 0.050 | 2.95 | 1.11 to 7.83 |
| RAG U'16** | 81 | 42.4 | 62 | 32.5 | 22 | 11.5 | 26 | 13.6 | 191 | 54.01 | 0.001 | 4.67 | 2.88 to 7.59 |
| NAG U'16* | 20 | 46.5 | 14 | 32.6 | 5 | 11.6 | 4 | 9.3 | 43 | 16.96 | 0.001 | 8.48 | 2.68 to 26.88 |
| NAG U'16** | 25 | 52.1 | 14 | 29.2 | 5 | 10.4 | 4 | 8.3 | 48 | 24.46 | 0.001 | 11.96 | 3.87 to 36.97 |

**Key:** Q1 – Q4 = quartiles 1 – 4, $\chi^2$ = chi-square value, $df$ = degrees of freedom for $\chi^2$, P-value = level of statistical significance for $\chi^2$, OR = odds ratio for Q1 vs Q4, 95% CI = 95% confidence interval for OR, Dist = district level players, RAG = regional age grade, NAG = national age grade, * = 1995/1996 year group, ** = 1996/1997 year group
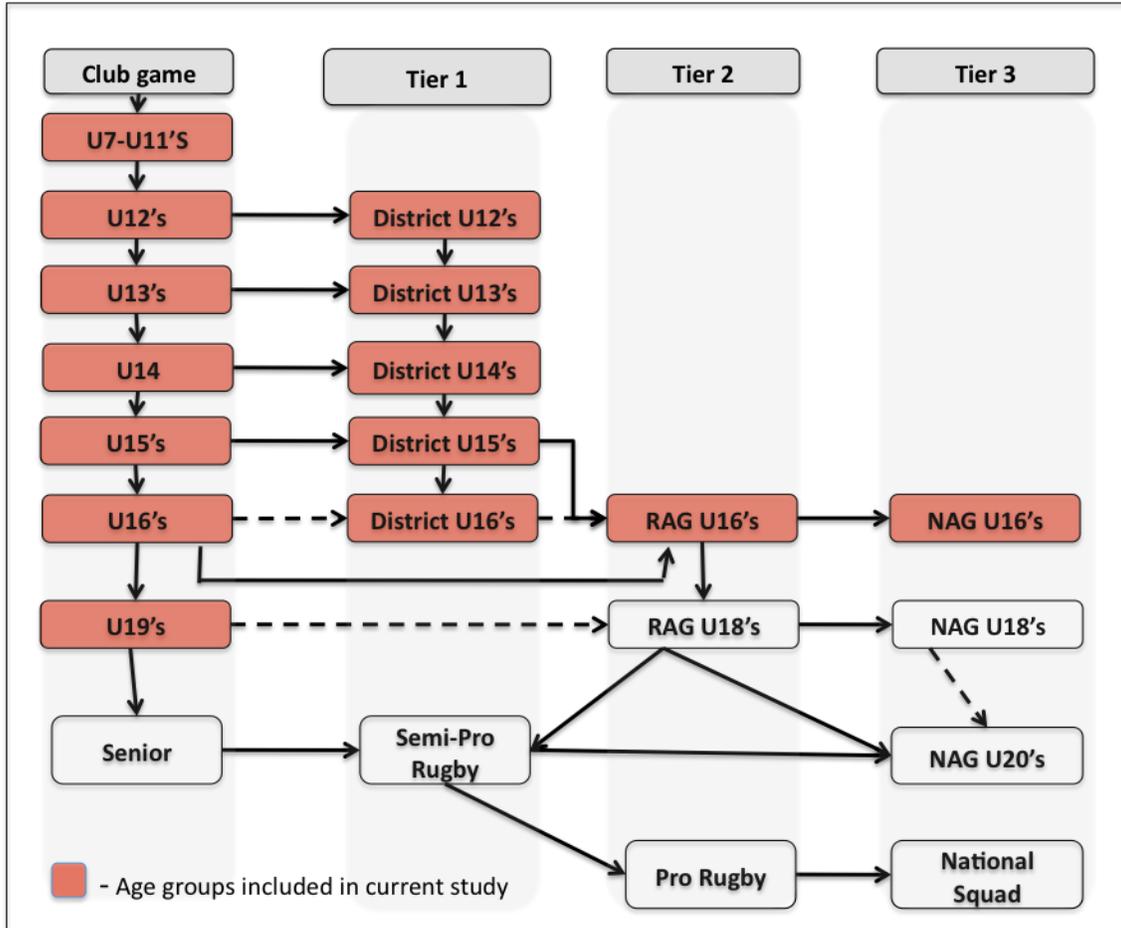
**Figure 1:** Playing Pathway and Performance Levels in Welsh Age Group Rugby Union
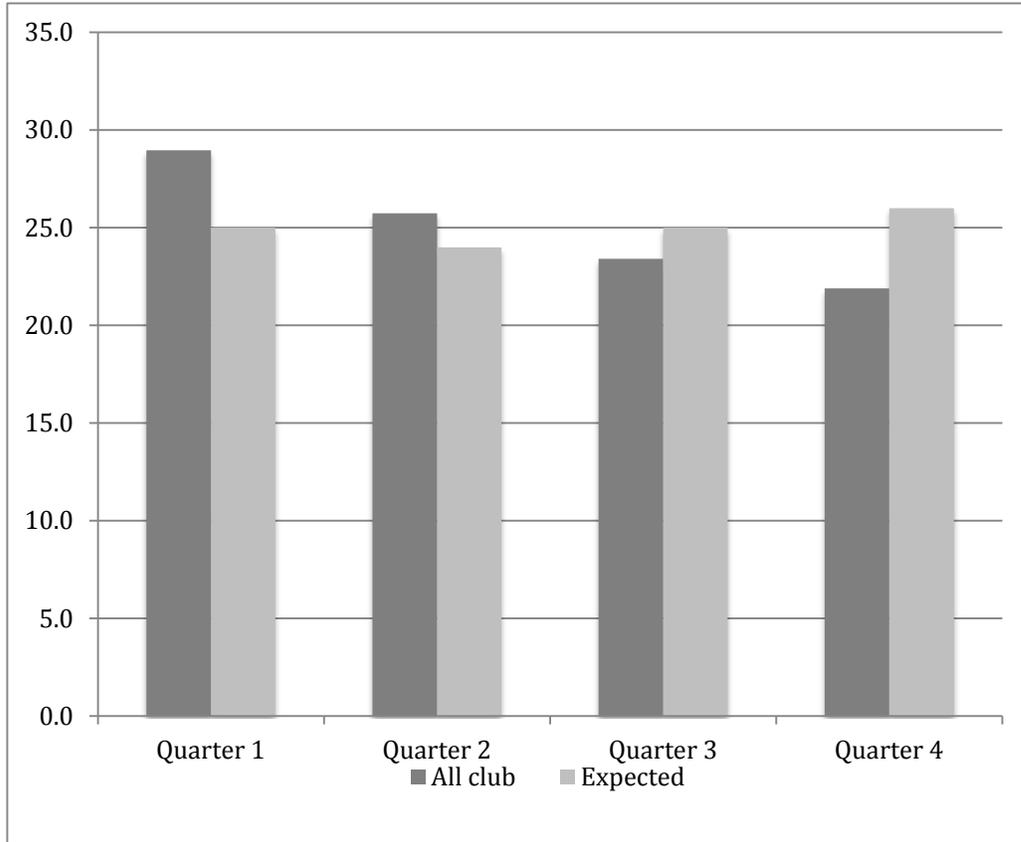
**Figure 2**:  Comparison of Expected Verses Observed Relative Age Distributions in Club Registered Players
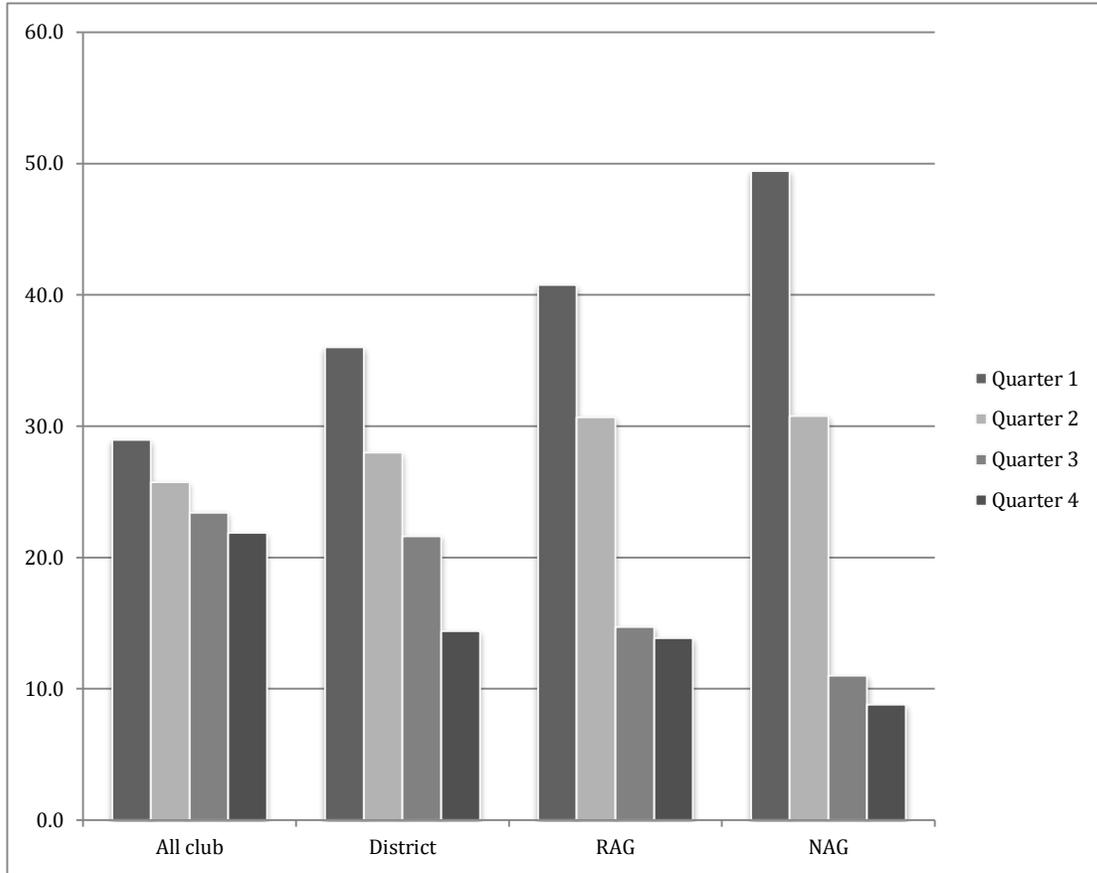
**Figure 3:** **Relative Age Distributions by Level of Performance**

**Key:** RAG = regional age grade, NAG = national age grade
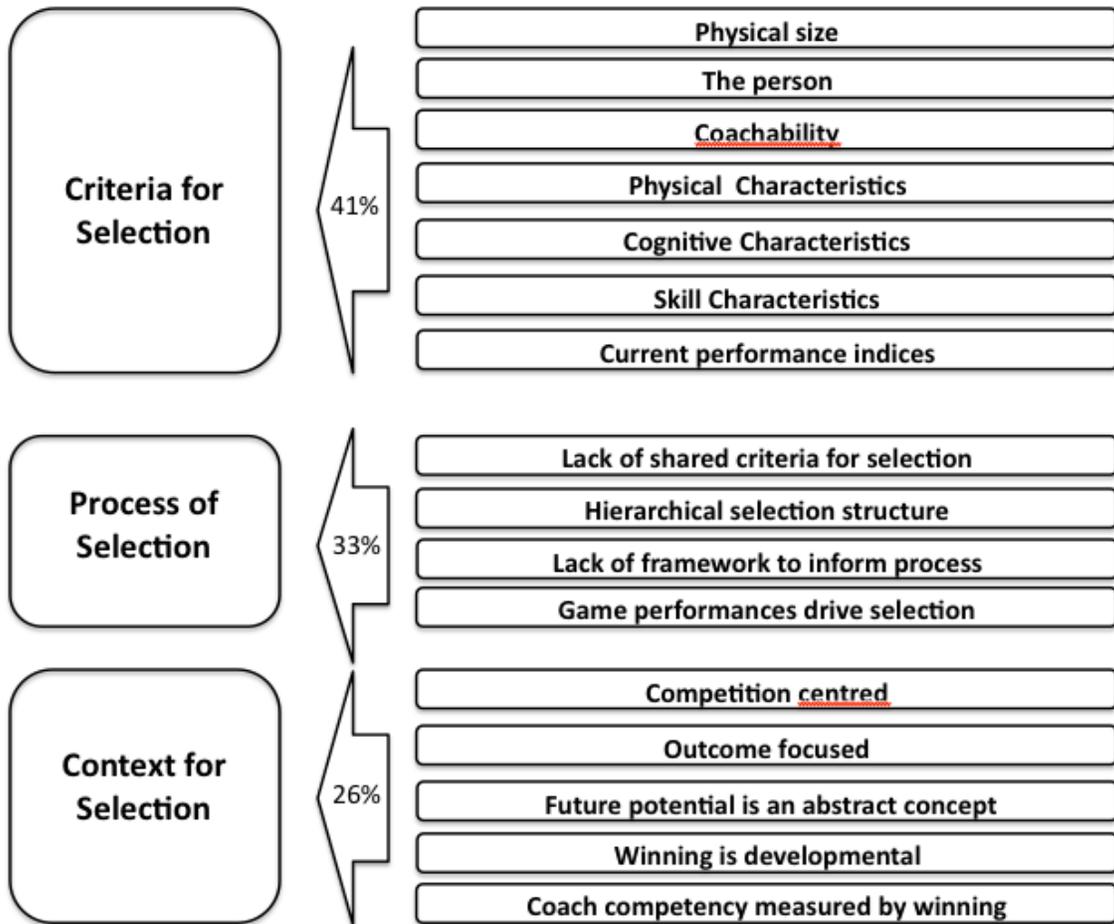
**Figure 4:**     **Thematic Analysis of Focus Group Transcripts**