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Relative Age Effects in Women's and Girls' Cricket

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Abstract

Background: Relative age effects (RAEs) refer to the overrepresentation of athletes born earlier in a selection year and may influence talent identification in sport. While RAEs are well-documented in male cricket, limited research exists in the female game. **Purpose:** To examine the prevalence of RAEs across the England and Wales Cricket Board (ECB) women's and girls' national talent pathway, from youth to senior levels. **Research Design:** A cross-sectional design comparing observed and expected birthdate distributions. **Study Sample:** Data were collected for 289 players from six cohorts: Regional Festivals (n = 108), School Games (n = 48), England U19 World Cup Squad (n = 15), and senior national squads—T20 (n = 47), ODI (n = 41), and Test (n = 30). **Data Collection and/or Analysis:** Players' birthdates were categorised into

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quartiles based on the UK academic year. Chi-square tests and odds ratios (95% CIs) were used to assess RAEs by cohort and skill set (batters, bowlers). Transitions from youth to senior levels were also examined. **Results:** Significant RAEs were identified in all youth cohorts, with relatively older players overrepresented. In contrast, senior cohorts showed a reversal effect, with relatively younger players more prevalent, particularly among those who played more matches. These patterns were evident across both batters and bowlers. **Conclusions:** RAEs are present in the ECB women's and girls' talent pathway, suggesting selection biases that may hinder long-term development. Stakeholders should implement strategies to create a more equitable pathway and support all players in realising their potential.

Keywords
talent identification, talent development, expertise, youth cricket, batting, bowling

Introduction

Over the last decade, there has been an increasing focus on enhancing the participation and professionalism of women's cricket in England and Wales. In 2014, the England and Wales Cricket Board (ECB) invested in 18 new professional contracts for female cricketers (Nicholson, 2020). However, over the next six years, the number of professional contracts remained unchanged, and by 2020, there were still fewer than 20 female professional cricketers in the UK (ECB, 2022a). The introduction of additional funding into women's cricket by the ECB, along with the establishment of the regional structure in 2020, led to a significant increase in professional contracts for female players. As of February 2023, there were 80 professional female cricketers, with ten contracts allocated to each of the eight regions, in addition to those on ECB central contracts (ECB, 2022a). A further reorganization will see the Regional structure replaced by 8 Tier 1 county teams in 2025, expanding to 12 teams by 2029. This restructuring could result in an 80% increase in the number of professional female cricketers in England and Wales (ECB, 2024).

To help grow the game, the ECB and other organisations have created initiatives nationwide to encourage females to become involved in cricket. Initiatives such as "All Stars Cricket", "Dynamos Cricket", "Take Her Lead", and "Chance to Shine" have been established, and with the support of cricket clubs and county age group squads, there is now a structured player pathway into talent identification programmes, such as regional academies, for female cricketers (ECB, 2022b). The goal of these talent pathway programmes is to identify a developing cricketer with the potential to become a successful senior performer (Till & Baker, 2020). However, selection into talent pathways is often objectively unclear and rely heavily on coaches, teachers, or scouts' perceptions of a young players potential (Lascu et al., 2020; Till & Baker, 2020). Young athletes are likely being selected into talent pathways based on current ability, rather than potential ability, as predicting future performance is difficult (Koz et al., 2012), and selecting talent at very young ages is even less accurate (Till et al., 2016). This comes with a range of implications for talent identification, and one of the most prominent and influential factors that may create biases in selection are relative age effects (RAEs) (McAuley et al., 2023; Till & Baker, 2020).

Due to the organisation of youth sport into annual age-groups, RAEs refer to the over-representation of those born nearer the beginning of the cut-off date compared to those who are born towards the end (Kelly, Till, et al., 2021; Wattie et al., 2015). This has been highlighted extensively in soccer (Carling et al., 2008; Doncaster et al., 2024; Doyle & Bottomley, 2018; Figueiredo et al., 2019; Kelly et al., 2020; Radnor et al., 2021), but also in other popular UK sports including rugby union (Kelly, Till, et al., 2021), basketball (Kelly, Jiménez Sáiz et al., 2021), and cricket (Jones et al., 2018; Kelly, Brown, et al., 2022; Radnor et al., 2023). In the context of cricket, Kelly, Brown and colleagues (2022) reported that selection into the ECB national talent pathway for males was biased towards those born earlier in the selection year. Specifically, odds of being selected for regional U15 and U17 squads as well as the U19 national squad as a cricketer born in the first quartile of the selection year (i.e., September to November) was 1.8–3.8 times more likely than a player born in the last quartile (June to August) (Kelly, Brown, et al., 2022). Even in younger age groups (U9-17) research has highlighted a relative age bias for county cricket pathways, with recent data highlighting that 62% of academy cricketers from England and Wales were born in the first half of the selection year (September to February), and 38% being born from the first birth quartile (BQ1) (Radnor et al., 2023). These findings suggest that relatively older boys are selected from a very young age and become exposed to a wealth of opportunities (e.g., greater access to coaching, competition, facilities, specialist support) that relatively younger players are not subjected to, which can have a major impact upon subsequent developmental outcomes (Till & Baker, 2020).

Interestingly, at the senior level, the influence of relative age on selection is more varied. For England senior squads, across all formats of cricket (i.e., T20, ODI, Test), there were no RAEs present (Kelly, Brown, et al., 2022), with similar findings have been reported in Australian senior state level cricket (Connor et al., 2019). Conversely, over a 20-year period, a selection of "super-elite" male cricketers displayed a bias towards relatively older players when all skill-sets were combined (Jones et al., 2018). The players skill-set (i.e., batting and bowling) also seems to influence RAEs, with more relatively older batters and spin bowlers are selected for senior teams, whereas more relatively younger pace bowlers are selected for the national squads (Kelly, Brown, et al., 2022). The reduced influence of RAEs at senior levels suggests more relatively younger players are selected into these senior squads, and recent research exploring the transition from youth to senior levels of the ECB national talent pathway in males confirm this (Kelly, Brown, et al., 2022). There appears to be a "reversal effect", where relatively younger players are significantly more likely to transition from youth to senior levels when compared to their relatively older counterparts (Brustio et al., 2023, 2024; Kelly et al., 2022). However, similar studies in female cricket are non-existent, and since previous research has showed RAEs can impact sexes differently (Andrew et al., 2022), the current research in men and boys should not be generalised for women and girls.

Based on current relative age research in youth sport, male RAEs appear to be more pronounced, whereas female RAEs appear to be more inconsistent (Smith et al., 2018). Research conducted in female sport has reported a relative age bias in tennis (Gerdin et al., 2018), swimming (Staub et al., 2020), soccer (Brustio, Modena, et al., 2023), and rugby union (Kelly, Jackson, et al., 2022). However, there is also research highlighting the absence of RAEs in female soccer (Andrew et al., 2022), rugby union (Kelly et al., 2024), and female athletics (Brazo-Sayavera et al., 2017). From the limited research into RAEs in female cricket, Connor and colleagues (2019) reported a relative age bias in U15 and U18 squads playing in the National Junior Championships in Australia, but not at senior state level cricket. More recently, Runswick et al. (2024) investigated 84 players (aged 15–21 years) enrolled on regional academy programmes within the eight women's professional cricket regions across England and Wales, revealing significant RAEs favouring relatively older players. However, the profile of females being selected into talent pathways in England as well as the transition from youth to senior levels in female cricket more generally has not been established.

Due to the specific relative age mechanisms between the two sexes (Kelly, Jackson, et al., 2022), it is essential to recognise that findings from the many male studies may not be transferable to female cohorts, thus research is needed to better understand RAEs specifically in women's and girls' cricket. Selection asymmetries favouring chronologically older players at youth, but not senior level, questions the efficacy of selection processes. Since talent pathways are designed to identify and develop those who have the potential to achieve expertise at adulthood rather than outperform peers at age group levels, it is important to understand selection asymmetries to help inform future selection decisions into these talent pathways. Therefore, the purpose of this study was to examine the prevalence of RAEs across the ECB women's and girls' national talent pathway.

Methods

Sample

The participants in this study were chosen as part of the ECB national talent pathway between 2011 and 2023 (n = 289). The time span for each cohort varied depending on the availability of data. Comprehensive datasets were collected for each cohort to ensure the most accurate representation. Following the structure of the ECB national talent pathway, participants were categorized into one of the following groups: (a) Regional Festivals (n = 108) between the years of 2021–2022, (b) School Games (n = 48) between the years of 2021–2022, (c) England U19 World Cup Squad 2023 (n = 15), (d) England T20 (n = 47) between the years of 2011–2023, (e) England ODI (n = 41) between the years of 2011–2022, and (f) England Test (n = 30) between the years of

2011 to2022[1]. All information was gathered from the publicly accessible Cricket Archive (2023).

Procedure

In accordance with the annual age group cut-off dates in England, this approach segmented the year into four equal birth quartiles (BQs), starting from September 1st as the first month and concluding with August 31st as the 12th month (Kelly, Brown, et al., 2022). Each participant was then assigned a BQ that corresponded with their birth date, allowing for the creation of an observed BQ distribution within each cohort of the ECB national talent pathway. The resulting BQ distributions from each group were then compared to National Norms, which represent the expected BQ distribution based on average national live births (Office for National Statistics, 2015). To assess the likelihood of reaching senior international status (including England T20, ODI, and Test levels) after entering the talent pathway at the youth stage, the senior BQ distributions were contrasted with the Regional BQ distribution (i.e., comparing entry and expertise; Kelly, Brown, et al., 2022). Additionally, players were categorized based on their skill sets, distinguishing between batters and bowlers. Batters were identified as those who batted for the majority (at least 75%) of their innings in the top six batting positions, while bowlers were defined as those who delivered at least one over in most (at least 75%) games participated in. The specific skill set distributions were as follows: (a) Regional Festivals (40 batters; 68 bowlers), (b) School Games (17 batters; 31 bowlers), (c) U19 World Cup Squad (7 batters; 8 bowlers), (d) England T20 (15 batters; 32 bowlers), (e) England ODI (17 batters; 24 bowlers), and (f) England Test (12 batters; 18 bowlers). Lastly, the numbers of games played by each participant were also compiled according to their BQ distributions.

Data Analysis

To compare the BQ distributions of each cohort against the expected BQ distributions, a chi-square (χ^2) goodness of fit test was used according to McHugh (2013). To assess the magnitude of differences between BQ distributions, Cramer's V was used with conventional effect size thresholds (0.06> = small, 0.17> = medium, and 0.29> large) (Cohen, 1988). To compare the likelihood of each BQ being selected, odds ratios (ORs) and 95% confidence intervals (CIs) were calculated, with statistical significance set at $p < .05$.

Results

Number of Players

When analysing the number of players, there was a significant difference between the School Games (χ^2 (df = 3) = 19.32, $p < .001$, V = 0.37) and U19 World

Table 1. The Observed and Expected BQ Distributions of the ECB Talent Pathway and Senior International Cohorts According to Number of Players.

Cohort	BQ1	BQ2	BQ3	BQ4	Total	$\chi 2$		Cramer's	BQ1 versus BQ4 OR	BQ4 versus BQ1 OR
National norms	25.46%	24.47%	24.65%	25.42%	(*n*)	(df = 3)	*p*	V	(CI)	(CI)
Regional	34	33	20	21	108	6.34	0.096	0.14	1.62	
All	31.48%	30.56%	18.52%	19.44%					(0.76–3.47)	
Regional	15	11	6	8	40	4.4	0.221	0.19	1.88	
Batters	37.50%	27.50%	15.00%	20.00%					(0.55–6.39)	
Regional	19	22	14	13	68	3.41	0.333	0.13	1.46	
Bowlers	27.94%	32.35%	20.59%	19.12%					(0.55–3.87)	
School games	23	15	7	3	48	19.32	**<0.001**	0.37	7.67	
All	47.92%	31.25%	14.58%	6.25%					(1.81–32.52)	
School games	11	4	1	1	17	15.27	**0.002**	0.27	11	
Batters	64.71%	23.53%	5.88%	5.88%					(0.93–130.33)	
School games	12	11	6	2	31	8.41	**0.038**	0.24	6	
Bowlers	38.71%	35.48%	19.35%	6.45%					(1.00–35.91)	
U19 world cup	8	6	1	0	15	9.41	**0.024**	0.46	8	
All	53.33%	40.00%	6.67%	0.00%					(0.66–97.32)	
U19 world cup	5	2	0	0	7	4.61	0.202	0.47	5	
Batters	71.43%	28.57%	0.00%	0.00%					(0.27–91.52)	
U19 world cup	3	4	1	0	8	3.08	0.379	0.36	3	
Bowlers	37.50%	50.00%	12.50%	0.00%					(0.15–59.89)	
England T20	10	11	15	11	47	1.43	0.699	0.10		1.1
All	21.28%	23.40%	31.91%	23.40%						(0.34–3.55)
England T20	2	5	3	5	15	1.85	0.604	0.20		2.5
Batters	13.33%	33.33%	20.00%	33.33%						(0.29–21.40)

(continued)

Table 1. (continued)

Cohort	BQ1	BQ2	BQ3	BQ4	Total	$\chi 2$		Cramer's	BQ1 versus BQ4 OR	BQ4 versus BQ1 OR
National norms	25.46%	24.47%	24.65%	25.42%	(*n*)	(df = 3)	*p*	V	(CI)	(CI)
England T20	8	6	12	6	32	3.13	0.371	0.18		0.75
Bowlers	25.00%	18.75%	37.50%	18.75%						(0.18–3.17)
England ODI	9	9	14	9	41	2	0.573	0.13		1
All	21.95%	21.95%	34.15%	21.95%						(0.28–3.57)
England ODI	4	3	4	6	17	1.01	0.799	0.14		1.5
Batters	23.53%	17.65%	23.53%	35.29%						(0.23–9.80)
England ODI	5	6	10	3	24	4.6	0.204	0.25		0.6
Bowlers	20.83%	25.00%	41.67%	12.50%						(0.10–3.72)
England test	4	9	9	8	30	2.47	0.480	0.17		2
All	13.33%	30.00%	30.00%	26.67%						(0.42–9.42)
England test	1	4	2	5	12	3.32	0.344	0.30		5
Batters	8.33%	33.33%	16.67%	41.67%						(0.34–72.77)
England test	3	5	7	3	18	2.65	0.449	0.22		1
Bowlers	16.67%	27.78%	38.89%	16.67%						(0.13–7.57)

Bold font denotes statistically significant chi-square at $p < .05$.

Cup Squad (χ^2 (df = 3) = 9.41, p = .024, V = 0.46) BQ distributions when compared to National Norms, with large effect sizes (see Table 1). The ORs identified an increased likelihood of relatively older players being selected, with the highest being BQ1 versus BQ4 for both School Games (OR 7.67; CI 1.81–32.52) and the U19 World Cup Squad (OR 8.00; CI 0.66–97.32). In comparison, there were no significant differences in Regional or senior (i.e., England T20, England ODI, and England Test) BQ distributions when compared to National Norms.

With regards to skill-sets, significant differences were present in School Games batters (χ^2 (df = 3) = 15.27, p = .002, V = 0.27) and bowlers (χ^2 (df = 3) = 8.41, p = .038, V = 0.24), with medium effect sizes favouring those who were relatively older. The

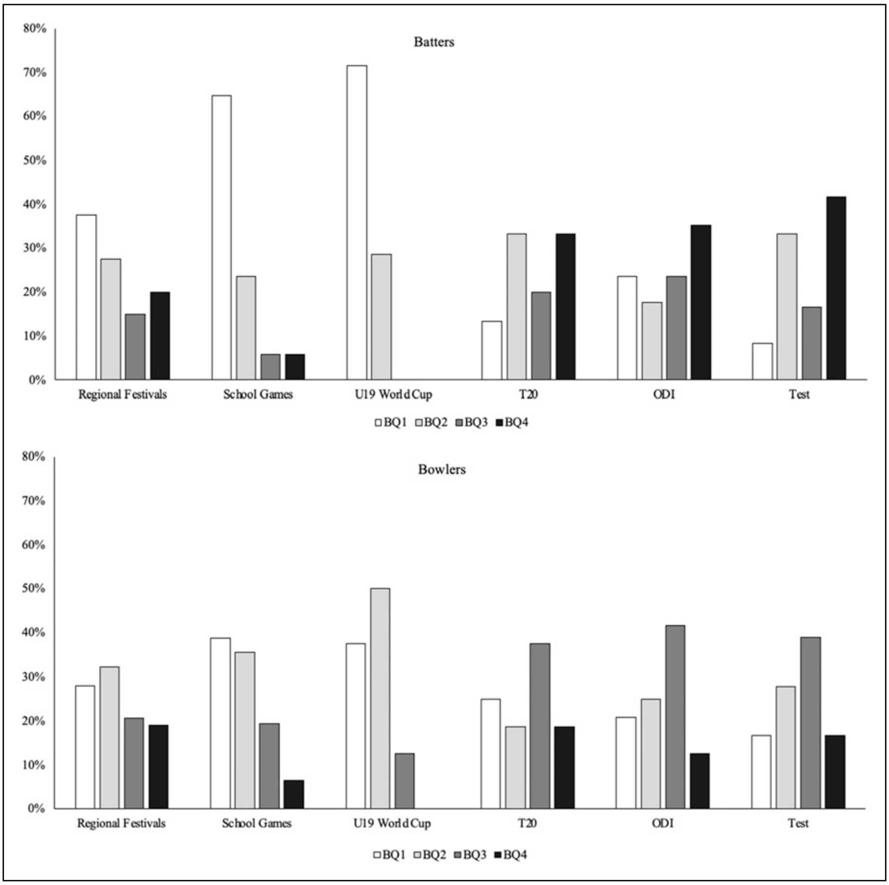

Figure 1. Birth quarter (BQ) distributions of batters and bowlers according to number of players.

Table 2. Entry versus Expertise According to Number of Players.

Cohort	BQ1	BQ2	BQ3	BQ4	Total (*n*)	$\chi 2$ (df = 3)	*p*	Cramer's V	BQ4 versus BQ1 OR (CI)
England T20	10	11	15	11	47	7.28	0.064	0.23	1.83
All (Expected distribution *)	15	14	9	9					(0.56–6.03)
England T20	2	5	3	5	15	3.11	0.374	0.26	4.17
Batters (Expected distribution *)	5	4	3	3					(0.47–36.74)
England T20	8	6	12	6	32	8.12	**0.044**	0.29	1.25
Bowlers (Expected distribution *)	10	10	6	6					(0.29–5.41)
England ODI	9	9	14	9	41	7.72	0.052	0.25	1.63
All (Expected distribution *)	13	12	8	8					(0.45–5.82)
England ODI	4	3	4	6	17	3.7	0.296	0.27	3
Batters (Expected distribution *)	6	5	3	3					(0.46–19.59)
England ODI	5	6	10	3	24	8.64	**0.034**	0.35	0.96
Bowlers (Expected distribution *)	8	7	4	5					(0.16–5.90)
England test	4	9	9	8	30	6.08	0.108	0.26	3
All (Expected distribution *)	9	9	6	6					(0.62–14.62)
England test	1	4	2	5	12	5.14	0.162	0.38	10
Batters (Expected distribution *)	4	4	2	2					(0.65–154.40)
England test	3	5	7	3	18	5.4	0.144	0.32	2
Bowlers (Expected distribution *)	6	6	3	3					(0.24–16.61)

*Expected distribution calculated from Regional BQ distribution. Bold font denotes statistically significant chi-square at $p < .05$.

highest ORs were BQ1 versus BQ4 for both batters (OR 11.00; CI 0.93–130.33) and bowlers (OR 6.00; CI 1.00–35.91). In contrast, no significant different BQ distributions were observed in batters and bowlers of Regional or senior cohorts when compared to National Norms (see Figure 1).

When comparing the senior cohorts BQ distributions with the expected BQ distributions based on the Regional cohort, there were no significant differences when grouping batters and bowlers together (see Table 2). However, there were significant differences with large effect sizes regarding bowlers of England T20 (χ^2 (df = 3) = 8.12, $p < .044$, V = 0.29) and England ODI (χ^2 (df = 3) = 8.64, $p < .034$, V = 0.35). The ORs identified an increased likelihood of relatively younger bowlers to transition to the senior cohorts, with the highest being BQ3 versus BQ2 for England T20 (OR 3.33; CI 0.81–13.64) and BQ3 versus BQ1 for England ODI (OR 4.00; CI 0.80–20.02).

Number of Matches Played

When analysing the number of matches played, there was a significant difference between the Regional BQ distribution when compared to National Norms, with a medium effect size (χ^2 (df = 3) = 87.30, $p < .001$, V = 0.22; see Table 3). Significant ORs identified an increased likelihood of relatively older players being selected, with the highest being BQ1 versus BQ3 (OR 2.39; CI 1.71–3.33). Similarly, there was a significant difference between the School Games (χ^2 (df = 3) = 95.39, $p < .001$, V = 0.43) and U19 World Cup Squad (χ^2 (df = 3) = 34.03, $p < .001$, V = 0.38) BQ distributions when compared to the National Norms, with large effect sizes. The ORs identified an increased likelihood of relatively older players being selected, with the highest being BQ1 versus BQ4 for both School Games (OR 13.41; CI 5.59–32.17) and the U19 World Cup Squad (OR 43.00; CI 5.43–340.38). Significant differences were also present in the senior BQ distributions of the England T20 (χ^2 (df = 3) = 330.47, $p < .001$, V = 0.26), England ODI (χ^2 (df = 3) = 139.04, $p < .001$, V = 0.18), and England Test (χ^2 (df = 3) = 15.60, $p = .001$, V = 0.22) players when compared to the National Norms, with medium effect sizes. However, the ORs identified an increased likelihood of relatively younger players being selected, with the highest being BQ3 versus BQ1 for England T20 (OR 4.37; CI 3.48–5.49) and England ODI (OR 2.68; CI 2.14–3.37), and BQ4 versus BQ1 for England Test (OR 3.50; CI 1.46–8.41).

With regards to skill-sets, significant differences were present in batters ((Regional (χ^2 (df = 3) = 65.45, $p < .001$, V = 0.25), School Games (χ^2 (df = 3) = 77.57, $p < .001$, V = 0.32), U19 World Cup Squad (χ^2 (df = 3) = 8.75, $p = .003$, V = 0.26)) and bowlers ((Regional (χ^2 (df = 3) = 29.44, $p < .001$, V = 0.20), School Games (χ^2 (df = 3) = 27.81, $p < .001$, V = 0.23), U19 World Cup Squad (χ^2 (df = 3) = 15.80, $p < .001$, V = 0.39)), with medium to large effect sizes in both batters and bowlers favouring those who were relatively older in all cohorts. The highest ORs for batters was BQ1 versus BQ3 in Regional (OR 3.05; CI 1.95–4.79), and BQ1 versus BQ4 in School Games (OR 14.25; CI 4.44–45.78) and U19 World Cup Squad (OR 31.00; CI 3.55–270.78), whereas the highest ORs for bowlers was BQ2 versus BQ4 in Regional (OR 2.24; CI 1.35–3.70), BQ1 versus BQ4 in School Games (OR 12.33; CI 3.28–46.31), and BQ2 versus BQ4 in U19 World Cup Squad (OR 21.00; CI 2.31–191.18) (see Figure 2).

When comparing the senior cohorts BQ distributions with the expected BQ distributions based on the Regional cohort, there were significant differences with large

Table 3. The Observed and Expected BQ Distributions of the ECB Talent Pathway and Senior International Cohorts According to Number of Matches Played.

Cohort	BQ1	BQ2	BQ3	BQ4	Total	$\chi 2$		Cramer's	BQ1 versus BQ4 OR	BQ4 versus BQ1 OR
National norms	25.46%	24.47%	24.65%	25.42%	(*n*)	(df = 3)	*p*	V	(CI)	(CI)
Regional	217	199	88	100	605	87.3	**<0.001**	0.22	1.41	
All	35.92%	32.96%	14.57%	16.56%					(1.56–3.00)	
Regional	139	108	44	58	349	65.45	**<0.001**	0.25	2.4	
Batters	39.83%	30.95%	12.61%	16.62%					(1.57–3.66)	
Regional	78	91	44	42	256	29.44	**<0.001**	0.20	1.86	
Bowlers	30.59%	35.69%	17.25%	16.47%					(1.12–3.09)	
School games	94	44	26	7	171	95.39	**<0.001**	0.43	13.41	
All	54.97%	25.73%	15.21%	4.09%					(5.59–32.17)	
School games	57	21	7	4	89	77.57	**<0.001**	0.32	14.25	
Batters	64.04%	23.60%	7.87%	4.49%					(4.44–45.78)	
School games	37	23	19	3	82	27.81	**<0.001**	0.23	12.33	
Bowlers	45.12%	28.05%	23.17%	3.66%					(3.28–46.31)	
U19 world cup	43	32	2	0	77	34.03	**<0.001**	0.38	43	
All	55.85%	41.56%	2.60%	0.00%					(5.43–340.38)	
U19 world cup	31	11	0	0	42	8.75	**0.003**	0.26	31	
Batters	73.81%	26.19%	0.00%	0.00%					(3.55–270.78)	
U19 world cup	12	21	2	0	35	15.8	**<0.001**	0.39	12	
Bowlers	34.29%	60.00%	5.71%	0.00%					(1.28–112.67)	
England T20	144	328	609	525	1606	330.47	**<0.001**	0.26		3.65
All	8.97%	20.42%	37.92%	32.69%						(2.90–4.59)
England T20	51	210	278	337	876	209.31	**<0.001**	0.28		6.61
Batters	5.82%	23.97%	31.74%	38.47%						(4.67–9.36)

(continued)

Table 3. (continued)

Cohort	BQ1	BQ2	BQ3	BQ4	Total	$\chi2$		Cramer's	BQ1 versus BQ4 OR	BQ4 versus BQ1 OR
National norms	25.46%	24.47%	24.65%	25.42%	(*n*)	(df = 3)	*p*	V	(CI)	(CI)
England T20	93	118	331	188	730	193.81	**<0.001**	0.30		2.02
Bowlers	12.74%	16.16%	45.34%	25.75%						(1.47–2.79)
England ODI	180	343	468	409	1400	139.04	**<0.001**	0.18		2.27
All	12.86%	24.50%	33.43%	29.21%						(1.81–2.86)
England ODI	54	173	255	288	770	170.06	**<0.001**	0.27		5.33
Batters	7.01%	22.47%	33.12%	37.40%						(3.75–7.58)
England ODI	126	170	213	121	630	40.02	**<0.001**	0.15		0.96
Bowlers	20.00%	26.98%	33.81%	19.21%						(0.69–1.34)
England test	10	33	32	35	110	15.6	**0.001**	0.22		3.5
All	9.09%	30.00%	29.09%	31.82%						(1.46–8.41)
England test	2	18	16	24	60	17.4	**<0.001**	0.31		12
Batters	3.33%	30.00%	26.67%	40.00%						(2.40–60.05)
England test	8	15	16	11	50	3.71	0.295	0.16		1.38
Bowlers	16.00%	30.00%	32.00%	22.00%						(0.42–4.53)

Bold font denotes statistically significant chi-square at $p < .05$.

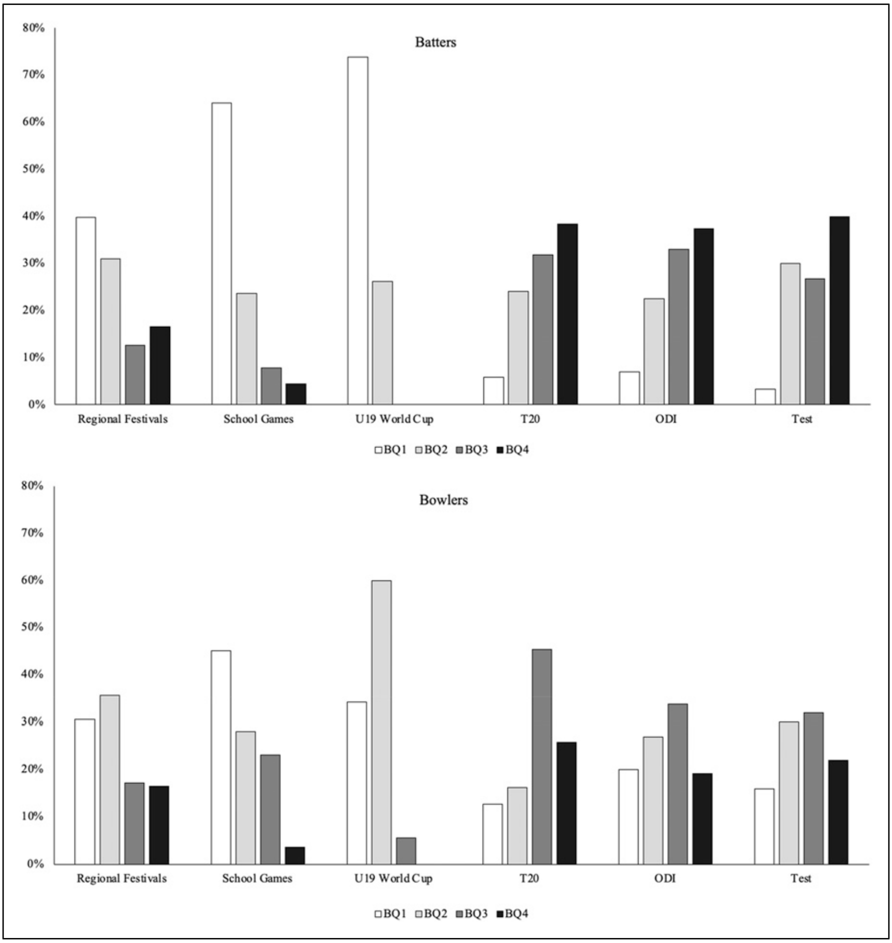

Figure 2. Birth quarter (BQ) distributions of batters and bowlers according to number of matches played.

effect sizes in all cohorts: (a) England T20 (χ^2 (df = 3) = 1254.84, $p < .001$, V = 0.51), (b) England ODI (χ^2 (df = 3) = 714.89, $p < .001$, V = 0.41), and (c) England Test (χ^2 (df = 3) = 53.72, $p < .001$, V = 0.40). Significant ORs identified an increased likelihood of relatively younger players to transition to the senior cohorts, with the highest being BQ3 versus BQ1 in England T20 (OR 10.45; CI 8.25–13.25) and England ODI (OR 6.41; CI 5.06–8.12), and BQ4 versus BQ1 in England Test (OR 7.78; CI 3.17–19.06).

With regards to skill-sets, significant differences were present in batters ((England T20 (χ^2 (df = 3) = 773.96, $p < .001$, V = 0.54), England ODI (χ^2 (df = 3) = 683.06, $p <$ .001, V = 0.54), England Test (χ^2 (df = 3) = 49.22, $p < .001$, V = 0.52)) and bowlers

Table 4. Entry versus Expertise According to Number of Matches Played.

Cohort	BQ1	BQ2	BQ3	BQ4	Total (n)	χ2 (df = 3)	p	Cramer's V	BQ4 versus BQ1 OR (CI)
England T20	144	328	609	525	1606	1254.84	**<0.001**	0.51	7.92
All (Expected distribution *)	576	529	233	265					(6.27–10.02)
England T20	51	210	278	337	876	773.96	**<0.001**	0.54	15.8
Batters (Expected distribution *)	349	271	110	146					(11.11–22.46)
England T20	93	118	331	188	730	526.19	**<0.001**	0.49	3.76
Bowlers (Expected distribution *)	223	261	126	120					(2.69–5.24)
England ODI	180	343	468	409	1400	714.89	**<0.001**	0.41	4.93
All (Expected distribution *)	503	461	204	232					(3.90–6.23)
England ODI	54	173	255	288	770	683.06	**<0.001**	0.54	12.79
Batters (Expected distribution *)	307	238	97	128					(8.96–18.27)
England ODI	126	170	213	121	630	139.49	**<0.001**	0.27	1.78
Bowlers (Expected distribution *)	193	225	108	104					(1.26–2.52)
England test	10	33	32	35	110	53.72	**<0.001**	0.40	7.78
All (Expected distribution *)	40	36	16	18					(3.17–19.06)
England test	2	18	16	24	60	49.22	**<0.001**	0.52	28.8
Batters (Expected distribution *)	24	19	8	10					(5.70–145.56)
England test	8	15	16	11	50	11.17	**0.011**	0.27	2.58
Bowlers (Expected distribution *)	15	18	9	8					(0.74–9.01)

*Expected distribution calculated from Regional BQ distribution. Bold font denotes statistically significant chi-square at $p < .05$.

((England T20 (χ^2 (df = 3) = 526.19, p < .001, V = 0.49), England ODI (χ^2 (df = 3) = 139.49, p < .001, V = 0.27), England Test (χ^2 (df = 3) = 11.17, p = .011, V = 0.27)), with large effect sizes in batters and medium to large effect sizes in bowlers favouring those who were relatively younger in all cohorts (see Table 4). The highest ORs for batters was BQ4 versus BQ1 in England T20 (OR 15.80; CI 11.11–22.46), England ODI (OR 12.79; CI 8.96–18.27), and England Test (OR 28.80; CI 5.70–145.56), whereas the highest ORs for bowlers was BQ3 versus BQ1 in England T20 (OR 6.30; CI 4.59–8.65), England ODI (OR 3.02; CI 2.19–4.17), and England Test (OR 3.33; CI 1.02–10.90).

Discussion

This study examined the prevalence of RAEs across the ECB women's and girls' national talent pathway, as well as exploring its impact on the youth to senior transitions in female cricketers for the first time. The main findings revealed a selection asymmetry favouring relatively older players across all youth cohorts (i.e., Regional Festivals, School Games, U19 World Cup) and skill-sets (i.e., batters, bowlers). However, in senior cohorts (i.e., England T20, England ODI, England Test) this selection asymmetry reversed, as more relatively younger batters and bowlers were selected compared to their relatively older counterparts. These data suggest that RAEs are prevalent throughout the ECB women's and girls' national talent pathway and are contributing to biased selection processes.

The overrepresentation of relatively older youth players in this study aligns with previous research on male (Kelly, Brown, et al., 2022; Radnor et al., 2023) and more specifically female (Connor et al., 2019; Runswick et al., 2024) cricketers. For instance, initial research by Connor et al. (2019) showed that earlier born U15 and U18 female players were overrepresented compared to their later born peers in the National Junior Championships in Australia between 2011 and 2015. Likewise, Runswick et al. (2024) recently found significant RAEs favouring relatively older players in women's professional cricket regions across England and Wales. Both of these studies also revealed that skill-set moderated RAEs in female players, whereby there was a greater overrepresentation of earlier born batters compared to bowlers (Connor et al., 2019; Runswick et al., 2024). This corresponds with the findings of this study, as whilst we found RAEs were evident in both skill sets, selection asymmetries were generally more pronounced in batters.

These differing skill-set effects align with the distinct developmental trajectories of male batters and bowlers (Brown et al., 2021), and may reflect greater attention on power hitting across the women's and girls' talent pathway (McErlain-Naylor et al., 2021). Other potential explanations for skill-sets moderating RAEs in cricket have been proposed by Kelly, Brown, et al. (2022). These include batters requiring a larger accumulation of practice to develop the necessary perceptual-cognitive skills (Weissensteiner et al., 2008), which may increase RAEs as it is more challenging for relatively younger players to 'catch-up'. Whereas bowlers require more time to achieve the physiological requisites (Pyne et al., 2006), which may reduce RAEs as relatively younger players have a greater opportunity to 'catch-up'. More research is required to fully understand the mechanisms underpinning these skill-set differences in both the women's and men's formats. However, irrespective of the underlying cause, it is important stakeholders employed in this specific sport setting acknowledge that players of different positions have diverse developmental trajectories (Brown et al., 2023).

The over-representation of relatively younger senior players in this study is relatively novel in comparison with previous research on senior female cricketers (Connor et al., 2019), but aligns with some findings from recent research on senior male cricketers (Kelly, Brown, et al., 2022). For instance, Connor et al. (2019) reported that there were no significant differences in the birthdate distributions of senior state level Australian female or male cricket players; although, descriptively there were more relatively older players selected. In an examination of the ECB men's national talent pathway, Kelly, Brown et al. (2022) found that whilst there were no significant differences in senior cohorts with regards to the number of players selected, from a matches played perspective, significant differences were observed that favoured earlier born players. Interestingly, however, when analysing the likelihood of achieving senior international levels following entry into the talent pathway at youth level, Kelly, Brown et al. (2022) reported that relatively younger players were significantly more likely to successfully transition compared to their relatively older counterparts, which corresponds with our findings.

Explaining the exact cause of RAEs at youth level or reversal effects at senior level in this study is challenging. Initially, RAEs had been attributed to the enhanced physiological skills of early maturing, relatively older athletes (Cobley et al., 2009; Wattie et al., 2015). It is important to recognise, however, that RAEs and maturity-related biases are two different constructs that work independently (Towlson et al., 2021), and recent research has suggested that there is limited correlation between physical performance and relative age (Parr et al., 2020; Radnor et al., 2021). Rather, RAEs are perhaps more likely to reflect a combination of factors, including psychosocial development and earlier access to coaching and facilities, although this has received limited research attention. As for reversal effects, the 'underdog hypothesis' has been proposed (Gibbs et al., 2012), whereby the comparatively greater challenge experienced by relatively younger players during early development necessitates the need to develop psychological, social, technical, and tactical skills to remain competitive. These skills then become more valuable towards adulthood as the advantages that accompany older relative ages attenuate, which could also help explain these current results (Kelly et al., 2020). However, Gibbs et al. (2012) only looked at RAEs in isolation without accounting for contextual, balancing factors of advantage (e.g., maturation, training age/experience and/or genetic factors). It could be argued that as RAEs (naturally) decrease, later born players will (naturally) have higher 'conversion rates'. Perhaps this occurs as a simple regression to the mean rather than as a 'mechanism/reversal effect'.

The findings of this study also align with previous suggestions that task and environmental constraints, such as the level of competitive play as well as the depth, maturity, and formality of competition, may moderate RAEs in particular sports contexts (Cobley et al., 2009; Smith et al., 2018; Wattie et al., 2015). For instance, when examining the trend across different levels of competitive play in youth cohorts, the magnitude of RAEs increased at higher competitive tiers. This may be explained by the increased importance placed on winning at international level, which consequently, amplifies the pressure to identify and select the highest performing (i.e., relatively older) players. The decreased prevalence of RAEs across the senior cohorts, however, may reflect that many players of senior squads developed during a period where the women's game had lower funding as well as less structured and formalised selection processes, which when combined with a much smaller pool of potential players, likely reduced RAEs. Similar findings have been reported in other sports settings such as the comparisons between established and emerging soccer nations (McAuley et al., 2024). As women's cricket continues to grow, it will be important to monitor the longitudinal prevalence of RAEs to better understand how increased participation, popularity, and competition influence selection processes.

Whilst this study presents novel evidence on RAEs in a previously unstudied population, there are some limitations that should be considered when interpreting the present findings. Although three youth cohorts were examined, it is important to recognise that these were cross-sectionally examined and do not provide a complete representation of the entire population within the ECB women's and girls' talent pathway. Moreover, skill-sets (i.e., batters, bowlers) were analysed to account for the diverse developmental trajectories different playing positions may have, however, other roles (e.g., wicket keeper, fielder) and more specific skill-sets (e.g., seam bowler, spin bowler) do exist that could further impact RAEs. As the women's game has only recently begun to become more professionalised, the current lack of available data prevented the inclusion of additional players and more precise positional analyses. Moving forward, it will be important for future studies to use the larger sample sizes that become available to conduct more representative, position specific, longitudinal research. Lessons learned from the men's game should be acknowledged so the same issues are not recreated during this initial growth of professionalisation, and this selection bias is addressed immediately. To that end, multidimensional approaches will be important to better understand how other potential biases (e.g., maturation, training age/experience levels, birthplace effects, ethnicity, relative access to wealth) interact with RAEs to influence development and selection in the women's game (Brown et al., 2024).

Conclusion

This study investigated the prevalence of RAEs in the ECB women's and girls' national talent pathway. Key findings revealed, at youth level, players who are born earlier in the selection year are significantly more represented, whereas, at senior level, players who are born later in the competitive year are significantly more represented. This selection asymmetry towards relatively older players at youth, but not senior level, questions the efficacy of current selection process within the ECB women's and girls' national talent pathway. It is important policy makers and practitioners working within female cricket across England and Wales acknowledge these selection asymmetries. Key industry stakeholders should collaborate with researchers to design, implement, and evaluate strategies, such as age-ordered shirt numbering for (extended) trials/training (Mann & van Ginneken, 2017), annual reporting, and appropriate coach education to facilitate a more appropriate and equitable development pathway, which provides all future female cricketers with the opportunity to fulfil their potential.

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Note

1. T20, ODI, and Test are three different formats and lengths of match-play in cricket. T20I = Twenty 20 International (20 overs or 120 balls/team (~3hrs)); ODI = One Day International (50 overs or 300 balls/team (all day)), and Test = play until all batters are out (consists of four innings with two per team (played over 4 or 5 days)).

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Dr John M. Radnor is a Senior Lecturer at Cardiff Metropolitan University, where he is the programme director of the MSc Youth Athletic Development course. He has a PhD in Paediatric Strength and Conditioning and has published numerous articles related to youth fitness development and talent identification. John has an applied coaching background and is an accredited strength and conditioning coach (ASCC) with the UKSCA. He has worked within a range of sports and collaborates with clubs

and National Governing Bodies to support their talent pathways. John leads the S&C programme within the Youth Physical Development Centre based at Cardiff Metropolitan University.

Rob Reed. Independent RAE researcher specialising in cricket. Affiliated to Corsham Cricket Club in the UK.

Alfonso de La Rubia. PhD, is Associate Professor of Sport Science at Universidad Politécnica de Madrid. Professional Handball Coach.

Paolo Riccardo Brustio, PhD is an Associate Professor at the Department of Clinical and Biological Sciences, University of Turin. His research focuses on talent identification in various sports contexts, with a particular emphasis on the Relative Age Effect (RAE) and career transitions from junior to senior levels. He is also involved in modeling team sports performance by quantifying the impact of individual players on team outcomes and game results. His work aims to address inequalities in athlete selection processes and to provide innovative solutions for enhancing competitive balance and optimizing athletic performance across different levels of competition.

Sergio L. Jiménez Sáiz, PhD, is a Full Professor in Sport Sciences at Universidad Rey Juan Carlos (Spain). His research focuses on strength and conditioning, talent development, and performance analysis in team sports. In addition to his academic work, Sergio has over a decade of experience as a professional basketball coach and performance director, including roles in the Spanish ACB League and with national teams such as the Dominican Republic and Saudi Arabia.

Adam L. Kelly, Ph.D., is Associate Professor of Sport and Exercise, Course Leader for Professional Doctorate in Sport (DSport), and Director of Research for Athlete and Youth Sport Development (RAYSD) Lab at Birmingham City University, United Kingdom. He is also a Research Associate at Universidad Rey Juan Carlos, Spain. Alongside completing a Ph.D. at the University of Exeter, United Kingdom, Dr. Kelly is senior fellow of the HEA, BASES sport and exercise scientist, and FA UEFA A licenced coach. Broadly, his research interests explore organisational structures in youth sport to better understand the athlete development process and help create more appropriate settings. He is currently collaborating with a number of global, national, and provincial organisations across a range of sports, including cricket, rugby union, soccer, squash, and swimming. In particular, Dr. Kelly is working closely with the FIFA Talent Development Scheme, helping the future of talent development systems in soccer across the world. He has successfully led five journal editorials, presented at over 50 international conferences, authored more than 120 scientific articles and book chapters, and edited two books, including Talent Identification and Development in Youth Soccer: A Guide for Researchers and Practitioners.