The relative age effect in the Gaelic Athletic Association (GAA): A mixed methods approach

Abstract

Gaelic football and hurling Talent Academies (TAs) and senior teams cater for high performing players, however only two previous studies have quantified the relative age effect (RAE) in these cohorts. Additionally, no studies to date have explored key stakeholder understanding of the RAE using qualitative methods. This study aimed to: (a) quantify the RAE in TAs and senior teams, and (b) investigate stakeholder perspectives of the talent development environment, providing practical insight into the RAE. A mixed methods sequential explanatory study design was employed. Phase one involved a retrospective analysis of longitudinal data for the frequency and distribution of births using TA (n=12,445) and senior (n=8,752) players. Phase two consisted of two focus groups of key stakeholders [coaches (n=4) and Talent Development Leaders (n=4)] in talent development in hurling and Gaelic football at TA and senior level. Analysis revealed a significant difference between TA birth quarter (BQ) distributions compared with expected distributions across all age groups (P<0.001; BQ1= 30.4% vs. BQ4=17.6%), while at senior level, there were no significant differences between the observed and expected BQ distributions (χ^2 (df = 3) = 3.812, P = 0.282). In phase two, inductive analysis explored key stakeholder perceptions revealing three higher order themes: (a) understanding of the RAE, (b) selection criteria, and (c) player characteristics. The GAA are encouraged to reflect on the practice of chronological age band grouping of players, investigate possible solutions to limit its effects, and offer support programmes to educate key stakeholders on the potential impact of the RAE on talent development.

Key Words: *Gaelic Games; RAE; Talent Identification; Selection Criteria; Player Development; Coach Decision Making*

Introduction

The Gaelic Athletic Association (GAA) is the sporting organisation that governs Gaelic football and hurling, with Gaelic football the most popular sport on the Island of Ireland (Teneo Sport and Sponsorship Index, 2020). The basic unit is the club, of which there are 2,066 affiliated, with 314,420 registered players (GAA, 2022). At the representative (Inter County) level, Talent Academies (TAs) and senior teams provide over 12,000 high-performing players with additional and enhanced player development programmes (GAA, 2014).[1] In order to produce the next generation of senior players, key stakeholders (i.e., full time staff, coaches, and practitioners) look towards TAs to offer developmental pathways for players to reach the highest levels and prepare them for the demands of future competitions (Mountjoy et al., 2008; Stambulova, 2016). Although TAs are a national programme, overseen by the GAA, counties operate independently based on their own unique philosophies and cultures, and while guidelines require them to hold TAs from U14 to U17, some have started the selection process at the U12/13 age groups in recent years (Cuthbert, 2018).

In the GAA, competitions are organised across all age groups using a fixed cut-off date of January 1st, whereby players compete within the annual age grade corresponding to their year of birth. While this grouping strategy is common, the variation in births within a given year, coupled with each player's individual stage of development, can lead to physical, psychological, emotional and performance imbalances (de la Rubia et al., 2020; Musch & Grondin, 2001), which may also be influenced by individual, task and environmental constraints (Wattie et al., 2015). These imbalances are often revealed as a selection bias leading to a larger proportion of players who's birth dates from the early months of the year

[1] At senior grade, counties field only one team in Gaelic football and hurling, while within the Talent Academy system counties may field multiple teams in each age group (U14-U17) in both playing codes.

being selected, and is widely acknowledged as the Relative Age Effect (RAE) (Cobley et al., 2009). To quantify the extent of the RAE in sport, the observed birth distributions are numerically categorised into birth quarters (BQs), which correspond to the number of players born at a particular time of the year (i.e., BQ1=first three months of the selection year vs. BQ4=last three months of the selection year). There are several hypothesised explanations for the manifestation of the RAE in sport. While it has been suggested that growth and maturation is a contributing factor (Cobley, 2009), playing experience coupled with an athletes cognitive, emotional, behavioural, motor, and social development are more likely to be the underlying causes (Romann et al., 2020). Additionally, the popularity of the sport, playing numbers, and competition level are all thought to enhance the existence of the RAE (Musch & Grondin, 2001). Furthermore, it has been suggested that key decision makers and social agents (i.e. Parents, coaches and athletes) influence the selection imbalances observed in team sports, which have been explained through theoretical models such as Matthew, Pygmalion and Galatea effects (Hancock et al., 2013).

The RAE was first explored in a sporting context in a study of adult Canadian ice hockey players (n = 715), where Barnsley et al. (1985) discovered that 61.8% of players were born in the first six months of the year, with players being twice as likely to be born in BQ1 compared to BQ4. Since then, numerous studies have assessed the frequency and impact of the RAE in team sports such as volleyball (Rubajczyk & Rokita, 2020), basketball (Goncalves & Carvalho, 2020), handball (Schorer et al., 2013), Australian rules football (Coutts et al., 2014; Tribolet et al., 2019), rugby league (Cobley et al., 2014; Till et al., 2010), rugby union (Kelly et al., 2021a), and soccer (Del Campo et al., 2010; Dugdale, 2021). While such studies highlight the significance of the RAE, it was commonly more pronounced at youth levels becoming less significant at senior levels (Helsen et al., 2005; Musch & Grondin, 2001). The decreasing RAE at senior levels may be explained by theories (e.g.,

reversal effects of relative age and the underdog hypothesis) that suggest relatively younger players who are initially disadvantaged, eventually catch-up (and potentially overtake) their relatively older peers through developing sport-specific skills over the long-term (Gibbs et al., 2012; McCarthy et al., 2016). However, not all studies of the RAE have shown a reversal of the selection bias of players as they transition through the development pathway. In particular, the RAE was found to be persistent across senior professional competitions in both the Australian Rules football talent development pathway (Tribolet et al., 2019) and elite German soccer (Götze & Hoppe, 2021).

To the author's knowledge, only two studies have investigated the RAE across the Gaelic games playing population. In their study of U13 to U20 players (n=2,194), Campbell et al. (2012) showed BQ1s were significantly overrepresented whereas BQ4s were significantly underrepresented across all age groups (BQ1=30.3% vs. BQ4=17.6%). Likewise, Power et al. (2012) revealed a RAE in U14 to U16 TA players (n=115), which favoured relatively older youth (BQ1=38.2% vs. BQ4=16.5%). While these studies highlight the existence of the RAE during a single season in GAA TAs, there is a need to examine the phenomenon over several years, as well as including senior levels, in order to capture trends in player development and selection policies at varying levels (Schorer et al., 2020). Moreover, since qualitative research is yet to exist in this context, coupling longitudinal data with key stakeholder perspectives will help capture the mechanisms of the RAE throughout the GAA. Given the technical, tactical, physical, and psychosocial requirements of GAA competitions, it is possible that key stakeholders are influenced by certain player characteristics during the selection phase that may exacerbate the RAE in Gaelic football and hurling (Campbell et al., 2012; Power et al., 2012). However, much of the current literature focuses on quantitative descriptions of the RAE, with few studies employing qualitative or mixed method approaches to enhance our understanding of the factors which may contribute

to the bias in selecting players born during the earliest stages of the year (Baker et al., 2020; Kelly et al., 2021e; Turnnidge & Kelly, 2021). Of the qualitative studies that do exist, it has been shown that key decision makers in rugby union may contribute to the onset of the RAE by selecting players with advanced physical characteristics and, therefore, place a greater emphasis on performance related outcomes (e.g., winning) rather than creating developmental opportunities for those with long-term potential (Lewis et al., 2015). Therefore, as key decision makers in the GAA, the views of coaches and other stakeholders are crucially important in order to gain an understanding of the individual talent development policies employed, and whether any influencing factors exist which may exacerbate the RAE and thus, affect the player development experience.

Given the absence of studies in the GAA which highlight the frequency of the RAE through longitudinal analysis, and the need to better understand key stakeholder experiences throughout youth and senior Gaelic football and hurling, this study employed a mixed method approach. Specifically, the aims of the study were twofold: (a) to explore the prevalence of the RAE in GAA Talent Academies and senior teams, and (b) to explore key stakeholder perspectives and experiences of the talent development environment in order to provide a level of practical insight into the RAE. Based on findings from similar research (e.g., Campbell et al., 2012; Power et al., 2012), it was hypothesised that the RAE would be present within the TA cohort and reduce in effect throughout each age group and become less significant at senior level. The second phase of the study would seek to explore key stakeholder (i.e., coaches and talent development leads) experiences of the talent development environment which may help inform current and future TA structures, as well as offer practical guidance to organisational decision makers in an attempt to improve player and key stakeholder experiences.

Methodology

Research Design

Given the absence of a longitudinal, mixed method approach to better understand the RAE throughout youth and senior Gaelic football and hurling, a sequential explanatory research design (Creswell et al., 2003) was applied to this current study using retrospective analysis of longitudinal data. Specifically, two successive phases of data collection and analysis were adopted. Phase one involved the collection and analysis of existing data sets of birth distributions in GAA TA and senior cohorts. Phase two included the collection and analysis of qualitative information through focus groups from key stakeholders (e.g., coaches and Talent Development Leaders[2]) within the GAA, in order to provide a level of practical insight and understanding of the RAE through the lens of those closely involved in the talent development pathway.

In line with Collins et al., (2019) suggested approach to talent development research, a pragmatic approach was adapted throughout this study. Often associated with mixed method studies, pragmatism is a research paradigm based on the idea that researchers should use the philosophical or methodological approach that best matches the particular problem under investigation (Tashakkori & Teddlie, 1998). Such an approach offers a degree of flexibility to the study design (Creswell & Clark, 2017), where the main focus is on the consequences of the study, in particular the research questions, rather than the methodology used.

Phase One: Quantitative Analysis

Participants

Following institutional (University College Dublin) and organisational (Gaelic Athletic Association and Gaelic Players Association) ethical approval, secondary datasets of both TA

[2] In this study, Talent Development Leader refers to full time employees of the GAA who are responsible for the organisation and implementation of player and coach development programmes (Talent Academies) in their counties.

Gaelic football and hurling male players aged 13 to 17 years (n=12,445) and senior male players (n=8,752) were analysed. These age groups were chosen as they represent the entire formal GAA pathway, including the initial entry phase to the TA programme (i.e., U14), the subsequent TA annual age groups (i.e., U15, U16, and U17), and the transitional phase between youth and senior level (i.e., U18+); all of which are crucial stages in the player development process (Lidor et al., 2021).

Procedures

Data for all TA players between 2013 and 2019 were obtained from the GAA's player monitoring database (Fusionsport, 2021). Simultaneously, senior player data between 2017 and 2020 were obtained directly from the Gaelic Players Association, the official representative body for all senior players. Birthdates for all players were categorised into the following quartiles based on the annual cut-off dates for the GAA competitions: (a) BQ1=January to March, (b) BQ2=April to June, (c) BQ3=July to September, and (d) BQ4=October to December. Players were then further categorised based on the following age groupings: (a) U14 (n= 3,118), (b) U15 (n=4,276), (c) U16 (n=3,296), (d) U17 (n=1,755), and (e) senior (n=8,752). To compare observed BQ distributions with those of the general population (i.e., national norms), male births between the years 1980 and 2005 (n=42,772) were obtained from the Central Statistics Office (2021) and Northern Ireland Statistics and Research Agency (2021), which reflected the birth distributions of the youngest to oldest players contained in this sample (BQ1=24.8%, BQ2=25.5%, BQ3=25.7%, BQ4=23.9%).

Data Analysis

Chi-square goodness of fit tests were used to analyse the observed age grouping BQ distributions with the expected BQ distributions based on the national norms. To determine the likelihood of a player from a particular BQ being represented, odds ratios (ORs) and 95% confidence intervals (CIs) were calculated, with BQ4 used as the reference group (i.e., BQ1

vs. BQ4, BQ2 vs. BQ4, and BQ3 vs. BQ4). A higher OR indicated an increased frequency of players born in a particular quartile compared to the reference quartile (BQ4) and were considered significant when the CI range was ≤1.00. Finally, to determine the effect size, Cramer's V was calculated and interpreted as either small (≥ 0.06), medium (≥ 0.17), or large (≥ 0.29), based on guidelines for degrees of freedom (df=3) (Kim, 2017). Results were considered significant where $P < 0.05$. All statistical analyses were performed using Microsoft Excel (Microsoft, Redmond, WA, USA).

Phase Two: Qualitative Analysis

Participants

Focus group participants were recruited from a convenience sampling of TA and senior coaches (male n=4; experience mean 12.75 years) and Talent Development Leaders (TDLs) (male n=4; experience mean 15.25 years)[3]. The sample of coaches recruited consisted of U14 Gaelic football (n=1), U17 Gaelic football (n=2), and senior Gaelic football (n=1), which represented the beginning (U14), middle (U17), and senior stages of the GAA player pathway. TDLs were recruited from both GAA codes (football n=2; hurling n=2) and represented a broad geographical demographic, in order to provide an accurate understanding of the unique structures within counties of different playing levels in Ireland. Participant characteristics are provided in Table 1.

*** Table 1 near here***

Procedures

Two focus groups were held remotely via Microsoft Teams (Microsoft, Redmond, WA, USA). Focus groups were selected as the primary research method as they allowed for the configuration of both groups with participants who were capable of providing in depth

[3] In this instance, experience refers to the number of years the TDL has been employed within the GAA and has had oversight over his counties Talent Development Programme. Coaches experience has been quantified by the number of years they have been actively coaching within the GAA at any level.

nuanced discussions on the specific research topic (Greenbaum, 1998). Two semi-structured interview schedules were developed using open-ended probing questions, which would explore the topic of the study from both the coach and TDLs perspectives (See appendix A). Both focus groups comprised questions around participant knowledge of the RAE, the type of player sought, and methods used during talent identification phases in TAs and senior teams, and whether a player's birth month was a significant factor during final selection decisions (e.g., "Do you think birthdate can influence someone's chances of being selected?, What is the basis for selection at each age grade?).

Data Analysis

Data were analysed manually using inductive content analysis, following the four staged framework described by Bengtsson (2016): (a) decontextualization, (b) recontextualization, (c) categorisation, and (d) compilation. After reading both transcripts, segments of transcriptions were separated into meaning units which were further condensed in either a descriptive or interpretive way and assigned codes related to the overall study aim. Generated codes were then collated and reviewed against the meaning units to determine if all aspects of the study aim have been met. By repeatedly reading the transcripts and analysing how the meaning units and codes fit with emerging themes, higher and lower order themes were developed based on commonly observed trends relevant to the research questions.

Methodological Rigor

In order to ensure effective qualitative research practices, the researchers reviewed the eight criteria as proposed by Tracy (2010) (worthy topic, rich rigor, sincerity, credibility, resonance, significant contribution, ethical, and meaningful coherence), which contributed to rigor in the study. This study was commissioned by the GAA who identified it as an area that would provide the organisation with additional information on player and coach development

practices. Further, as this was, to the author's knowledge, only the third study of the RAE in the GAA, and the first to use a qualitative methodology, it was considered a *worthy topic*. The collection and analysis of large data sets, and importantly the use of two focus groups using participants with contrasting perspectives of player development, ensured the study met the criteria for *rich rigor*. *Sincerity* was embraced throughout the research process whereby the lead author endeavoured to remain unbiased during focus group discussions, to ensure he did not influence the nature of the responses received. Additionally, the accuracy of both the quantitative data, and the reflections from multiple stakeholder experiences, ensured a *credible* research design was used. The nature of the findings highlighted the reality of talent selection practices within the GAA, and these findings may *resonate* with the reader through their past or current experiences. In addition, this study may advance knowledge of the reader on the extent of the RAE in both youth and senior cohorts, as well as the factors that influence this. This knowledge may also help inform future organisational structures, in order to enhance the player development experiences in GAA pathways and, therefore, the study *significantly contributes* to current literature and applied practice. Due to the large volume of player data, the majority of which pertained to players who were under the age of eighteen, appropriate *ethical* procedures were followed at all times. Subsequently, procedural ethics were adhered to that protected the identity of both players in the data set and participants partaking in focus group discussions. Finally, ensuring *meaningful coherence*, this study achieved its stated goals and interconnected each stage of the research process so as to accomplish the intended outcomes.

Results

The results of both phases of the research design are presented hereafter in sequential order. Phase one outlines statistical analysis conducted on the TA and senior secondary data

sets. Phase two presents an overview of the themes obtained during the focus group discussions.

Phase One

Descriptive statistics, including the frequency and distribution of BQs at each age group, are presented in Table 2. When all age groups were taken together, the chi-squared (χ^2) goodness of fit test indicated that the proportion of players in each BQ included in the TA sample was significantly skewed compared to the expected distributions based on national norms, with a small effect size (χ^2 (3) = 402.133, $P < 0.001$). Significant ORs showed how players who were selected to TAs were more likely to be born earlier in the year, with a greater likelihood of being born in BQ1 or BQ2 compared to BQ4. Specifically, a TA player was almost 1.7 times more likely to be born in BQ1 (1.67; 95% CI 1.55-1.79) and 1.5 times more likely to be born in BQ2 (1.49; 95% CI 1.38-1.60) when compared to BQ4. With regards to the senior level, the RAE was less pronounced (i.e., BQ1=25.3% vs. BQ4=23.1%), with no significant differences between the observed and expected BQ distributions (χ^2 (df = 3) = 3.812, $P = 0.282$).

Table 2 near here

Phase Two

Inductive analysis of the data highlighted three higher-order themes: (a) participants had little understanding of the confounding effects of the RAE, (b) consistent player identification and selection criteria were absent, and (c) preferred player characteristics at each age group were explored. Seven lower-order themes were included in these high-order-themes, which are presented in Table 3 alongside sample quotations in order to illustrate the analysis process.

Table 3 near here

RAE Understanding

Participants reported the RAE as a concept which they were broadly aware of, however, during trial periods and the playing season as a whole, it was rarely considered as part of the talent identification, selection, and development process:

"I'd be wrong to say that when we were doing trials at U14 that I knew the ages or the dates of the month. We didn't to be honest" (Coach 2).

"I wouldn't know the [player's] date of births within the year, not with Talent Academies, no" (Coach 3).

Although an understanding of the RAE was limited, some coaches explained that recently they have begun to develop their knowledge on its significance in player development, although it was not until they had left their roles within TAs that they chose to educate themselves further:

"It was always something I was conscious of but not in Talent Academies. But when I went back to my club, I was certainly more conscious of it" (Coach 1).

Player Identification and Selection Criteria

There was mixed evidence on the existence and implementation of prescribed selection criteria, with coaches required to collaborate with their fellow coaches to make key player selection decisions. For instance, one TA coach suggested that it is often his own observation and instinct as a coach which form the opinion on whether a player meets the desired standards of a TA player:

"No, there isn't. There isn't a prescribed set of criteria that we would work to or try to identify players from, it's very much observation and instinct in relation to yourself to say look, can they play ball?" (Coach 2).

Additionally, one TDL noted that while selection criteria had previously existed in his county, there is a need for universal selection criteria in GAA TAs, as decisions are now often left to coaches when deciding the type of player to be selected:

"We would have written down selection criteria but the more we're looking at it, it's probably the coaching eye, word of mouth, observation of players in their clubs and school environment. Would it be helpful to have an outline at various age levels? I think it would be because it is evolving all the time" (TDL 2).

However, one TDL revealed the benefits to having a set of criteria within their TA teams, as it ensured a level of consistency annually, as well as reduced potential conflict situations when it came to player selection decisions:

"We had five criteria and the lads [coaches] that we have back every year know the process, you know, but we trust them to pick the right lads. The process is important because parents come with an email, so you have to have a procedure or process to go back to when the problems arise" (TDL 1).

Interestingly, although TDLs explained that they had an awareness of, and in some cases clearly defined selection criteria in their TAs, this was not the unanimous feeling amongst coaches who felt that key decisions are the responsibility of individual coaches.

Player Characteristics

Participants stated that depending on the age group they were associated with, the desired player qualities should be reflected in the level at which they play. For example, at U14/15/16, participants emphasised several qualities such as technical, tactical, team play and coachability however, as they progressed to U17 level, a more balanced player was preferred:

"At U14/ 15 you are looking at technical ability and skill set" (Coach 4).

"At 14/15/16 its technical ability and tactical decision-making ability, team play ability, coachability" (TDL 1).

"We would have said once we took the U16 squad and are a year out from minor [U17], you're really looking at the more rounded player and their application in terms of the whole buy in" (Coach 4).

"And it just kind of all in terms of what we were looking for at that age [U17], you are looking for the better players in terms of ability" (Coach 3).

At senior level, participants described the need for players to possess advanced levels of physicality and skillset due to the increased demands and responsibilities required at that level:

"You have to look at it from a physical hardware point of view of nowadays. Have they the capacity to train at an elite level? The capacity where a guy who might look spectacular and have a great club championship, and is known by his physical attributes, he just might not be able to play elite football" (Coach 1).

While it was revealed that players are selected based on several characteristics and behaviours (e.g., coordination, decision-making, athleticism, coachability, tactical, technical, and team play ability), and although there was some evidence of a prescribed selection criteria amongst TDLs, this was not communicated directly to coaches. Additionally, a player's physical ability was not revealed to be a decisive factor during selection opportunities, particularly at TA level and, therefore, as participants were unaware of a player's date of birth and the overall concept of the RAE, it cannot be assumed that they purposely selected chronologically older players.

Discussion

The aims of the study were twofold: (a) to explore the prevalence of the RAE in GAA Talent Academies and senior teams, and (b) to explore key stakeholder perspectives and experiences of the talent development environment in order to provide a level of practical insight into the RAE. It was hypothesised that the RAE would be present within the TAs, reducing in successive years and eventually becoming less significant at senior level (Cobley & Till, 2017). Phase one revealed that in each annual age group at TA level, there was an over-representation of players born in the early stages of the year compared to those born

later in the year (i.e., U14-17 BQ1=30.4% vs. BQ4=17.6%). However, at senior level the RAE was less pronounced, with results indicating an even distribution of birthdates (i.e., BQ1=25.3% vs. BQ4=23.1%). These findings are consistent with both previous studies of the RAE in the GAA by Campbell et al. (2012) and Power et al. (2012), who observed similar effects in their TA sample cohort. Indeed, these findings partially support our initial hypothesis. The second phase of the study explored key stakeholder (i.e., coaches and full-time employee) perspectives and experiences of the talent development environment in order to provide a level of practical insight into the RAE. Findings revealed that key stakeholders had a limited understanding of the RAE and how it impacted key player selection decisions. Additionally, the implementation of a prescribed selection criteria was found to be inconsistent, with coaches often required to use their own experience and judgement when making key selection decisions. Finally, participants described several player characteristics preferred during the identification and selection phases of TA and senior teams in the GAA.

Regarding the quantitative findings, despite the RAE being significant throughout the TA sample, it did not decline as expected since it remained consistent between the U14 and U17 age groups, before levelling off somewhere between U17 and senior. These findings are contrary to previous RAE literature in youth sport (Doncaster et al., 2020; Dugdale et al., 2021; Lidor et al., 2021), where results indicated that it was common for the RAE to decrease with age, however, some studies do support the continued presence of the RAE throughout the player pathway up to and including senior professional level (Tribolet, 2019; Götze & Hoppe, 2021). One suggestion for this ongoing selection bias is that the selection practices of key stakeholders in GAA TAs continues to favour “older” players later in the development pathway, despite physical advantages becoming less pronounced (Dugdale et al., 2021). It could also be suggested that coaches adopt a continuous preference to selecting physically dominant players or perhaps demonstrate a loyalty to those players who they had initially

selected earlier in the development pathway ahead of those on the periphery of the squad (Cripps et al., 2016). Coaches revealed that they sought for a more "well-rounded player" at older age grades which may highlight that the physical attributes of players continue to influence the selection process and are, therefore, of some importance. Coupling this with the acknowledgement that participants were broadly unaware of player date of births before and during selection opportunities, enhances the likelihood of a strong bias towards selecting those born in BQ1 or BQ2. Further, the lack of a consistent selection criteria suggests that coaches select players based on their own intuition and experience and are therefore more likely to make personal decisions on a players future talent (Roberts et al, 2021). However, further research is required to better understand how the initial entry into TAs (i.e., U14) has a knock-on effect of relative age in subsequent age groups (i.e., U15, U16, and U17).

The results of phase one of this study were further supported by the inclusion of a qualitative design, where the perspectives of key decision makers (coaches and TDLs) were explored in the context of the RAE revealing several interesting findings. First, coaches had little knowledge of the concept of the RAE (i.e., RAE understanding). Second, coaches did not consider nor were they aware of player birth dates during the selection process at TA or senior level (i.e., player ID and selection criteria). Finally, the type of player preferred by participants across the various age groups was revealed, where those possessing several qualities, characteristics, and behaviours (e.g., technical, tactical, team play ability, attitude, physical hardware, and coachability) were deemed preferable. These findings would seem to support those of the quantitative analysis where the strong selection bias (i.e., RAE) was observed across all teams at TA level in particular. Despite significant experience, the absence of an understanding of the RAE amongst participants is somewhat surprising, even within the amateur environment of the GAA. Although it might be reasonable to assume that participants should be aware of the mechanisms of the RAE (Helsen et al., 2012), findings

justify why player birth dates were not considered, as the relevance of such information may not have been fully understood. As previously mentioned, findings revealed that participants identify and select players based on several characteristics and behaviours across each of the age groups. However, as they were unaware of player birth dates, it cannot be assumed that they purposely selected those who were chronologically older. Subconsciously, coaches may be influenced by a players technical or physical ability and, therefore, their selection is deemed automatic based on these qualities (Helsen, 2000). Nevertheless, it is important to recognise that social and psychological factors may also contribute to the onset of the RAE (Doncaster et al., 2020), and should be considered as part of a holistic selection process (Kelly et al., 2021b). Further, while skill levels are an important quality for GAA players to possess, their perceived ability may be enhanced by their physical size and therefore coaches may be (un)consciously biased towards selecting those who are physically superior to their teammates (Delorme et al., 2009; Delorme & Raspaud, 2009; Meylan et al., 2010).

These results are concerning for those responsible for organisational and competition structures within the GAA. Specifically, somewhere during the transition phase (i.e., U17 to senior), players who once represented the majority (BQ1s and BQ2s) are disappearing from the elite pathway. While it is evident that relatively younger players are "catching-up" with their relatively older peers, possibly through the creation of a competitive environment with their older teammates (Gibbs et al., 2012; McCarthy et al., 2016), the current status of older players is a cause for reflection for the GAA. Although findings have shown that relatively older players tend to be recruited into talent development pathways at youth levels, it seems they comprise a greater percentage of those who fail to succeed at senior levels (Kelly et al., 2022). Moreover, it should be determined whether these players are leaving the game completely or returning to a lower playing level with their clubs, since long-term participation at any level should be priority for TAs when recruiting young players. Thus,

although the RAE may have important implications on the immediate outcomes and short-term opportunities for relatively younger players, they could also have a detrimental effect on the long-term outcomes for relatively older players (Turnnidge & Kelly, 2021). Nevertheless, the underrepresentation of relatively younger players across all stages of the GAA TA system is a more pressing issue for the GAA as these players may not have the opportunity to experience a high performance training environment which may enhance their overall development in the long term. Due to the decline in physical and developmental advantages, those chronologically younger players (i.e., BQ1s & BQ2s) who are selected to GAA TAs may eventually develop superior abilities which will elevate them above their older peers (Votteler & Höner, 2014; Cumming et al., 2018), however, if they are not provided with the opportunity to flourish, they may never reach their full potential as young players. This may suggest that as time goes on, young players who are less mature will drop out of the GAA entirely, as they are not as successful, motivated, or fulfilled by the playing experience any longer (Stracciolini et al., 2016).

Future Research Directions

Following on from the presented findings, considerations for future research are provided for key stakeholders when attempting to alleviate the causes and effects of the RAE (see Figure 1). Strategies such as age and anthropometric banding (MacDonald et al., 2009), birthday-banding (Kelly et al., 2020), multi-squads (Musch & Grondin, 2001), RAE quotas (Barnsley & Thompson, 1988), and delayed selection practices (Cobley et al., 2019) have all been proposed as alternatives to the common chronological age-based systems and appear to address the mechanisms of the RAE and create a positive player development environment (Webdale et al., 2020). However, there are currently no studies in Gaelic football or hurling that has designed, implemented, and evaluated these potential solutions. Thus, future research

is encouraged to apply these possible solutions in order to better understand how to potentially reduce the RAE and create settings that are more appropriate across the GAA.

The findings from this study are novel as it is the first to simultaneously investigate the RAE in GAA TA and senior player cohorts, while incorporating data from key decision makers in talent identification and selection procedures, advancing previous studies by Campbell et al. (2012) and Power et al. (2012). Interestingly, in the decade since the publication of these studies little change has been introduced at an organisational or local level in the GAA, as current findings continue to highlight a significant RAE in all TA age groups. Thus, future research is warranted to observe and inform contemporary practices throughout the GAA to ensure key stakeholders better understand the RAE through education (Grossmann & Lames, 2013), are provided with clear selection criteria with markers of potential over performance (Kelly et al., 2021c), and ensure player characteristics are recognised as holistic and long-term focussed (Kelly et al., 2021d).

Figure 1 near here

Limitations

A unique element of this study was the inclusion of a qualitative component that complimented the findings of the quantitative phase. While the data retrieved was invaluable to the study, the sample size of coaches and TDLs reflected only a small proportion of those who are actively coaching and supporting GAA TA programmes across Ireland and may not provide an overall assessment of specific practices, cultures and traditions within each individual county, which may have influenced the findings. It is also worth noting that qualitative findings may only be relevant to Gaelic football coaches as the cohort used in this sample did not include any hurling representatives, although the inclusion of hurling TDLs contributed to the quality of the study.

This study was strengthened by the large sample size of 21,197 TA and senior players, which was comprised of up to eight years of retrospective data. One limititation to this meant that there was a distinct possibility that players appeared more than once in the dataset in subsequent years (i.e., U16 and U17) however, as the data were anonymised we were unable to remove duplicate players from the sample. Additionally, it is possible that players in the TA sample were represented in the senior cohort once they had progressed through the Academy system however, removing duplicates was beyond the scope of this study due to the absence of player identities. Nevertheless, it accurately depicts those who have competed at each TA and senior annual age group across these seasons.

Finally, although in line with previous studies of the RAE (i.e., Dugdale et al., 2021; Rubajczyk & Rokita, 2020), the comparison of both the TA and senior player samples with the general population and not with the general Gaelic games playing population is a limitation. Future studies should seek to compare playing samples with the overall participation pool (e.g., comparing the birth quartiles of under 14 TA players with those of all under 14 players in Gaelic games) to investigate the possibility of whether coaches recruit players from an already biased RAE pool.

Conclusion

This study is the first to quantify the RAE in both codes (Gaelic football and hurling) across every county participating in GAA Talent Academy and senior grades, while seeking to explore key stakeholder perceptions and understanding of the RAE. Analysis revealed a significant and ongoing selection bias exists in the GAA TA pathway (i.e., U14 – U17), while at senior level, no such bias was found. Focus group discussions revealed three higher order themes: (a) participants had little knowledge of the confounding effects of the RAE, (b) player identification and selection criteria were absent, and (c) preferred player characteristics at each age group were explored. This study provides key stakeholders in the GAA with

492 useful data on the RAE within its cohorts, as well as offering a clearer understanding of the
493 selection practices currently implemented. In the immediate future, further collaboration may
494 be required between the GAA and researchers to investigate potential strategies that may
495 reduce the RAE and promote positive player experiences within their respective teams.

Disclosure Statement

The authors declare that they have no conflict of interest.

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List of Figures and Tables

Table 1. Focus Group Participant Characteristics

Participant	Experience (Years)	Gender	County	ID
Academy Coach (Under 14)	12	M	Tier 2 FB	Coach 4
Academy Coach (Under 15)	8	M	Tier 2 FB	Coach 3
Academy Coach (Under 17)	6	M	Tier 1 FB	Coach 2
Senior Coach	25	M	Tier 1 FB	Coach 1
TD Leader	12	M	Tier 1 Dual	TDL1
TD Leader	18	M	Tier 1 H	TDL2
TD Leader	15	M	Tier 2 FB	TDL3
TD Leader	16	M	Tier 2 FB	TDL4

Table 2. Analysis of birth-date distributions by BQ amongst TA and senior GAA players.

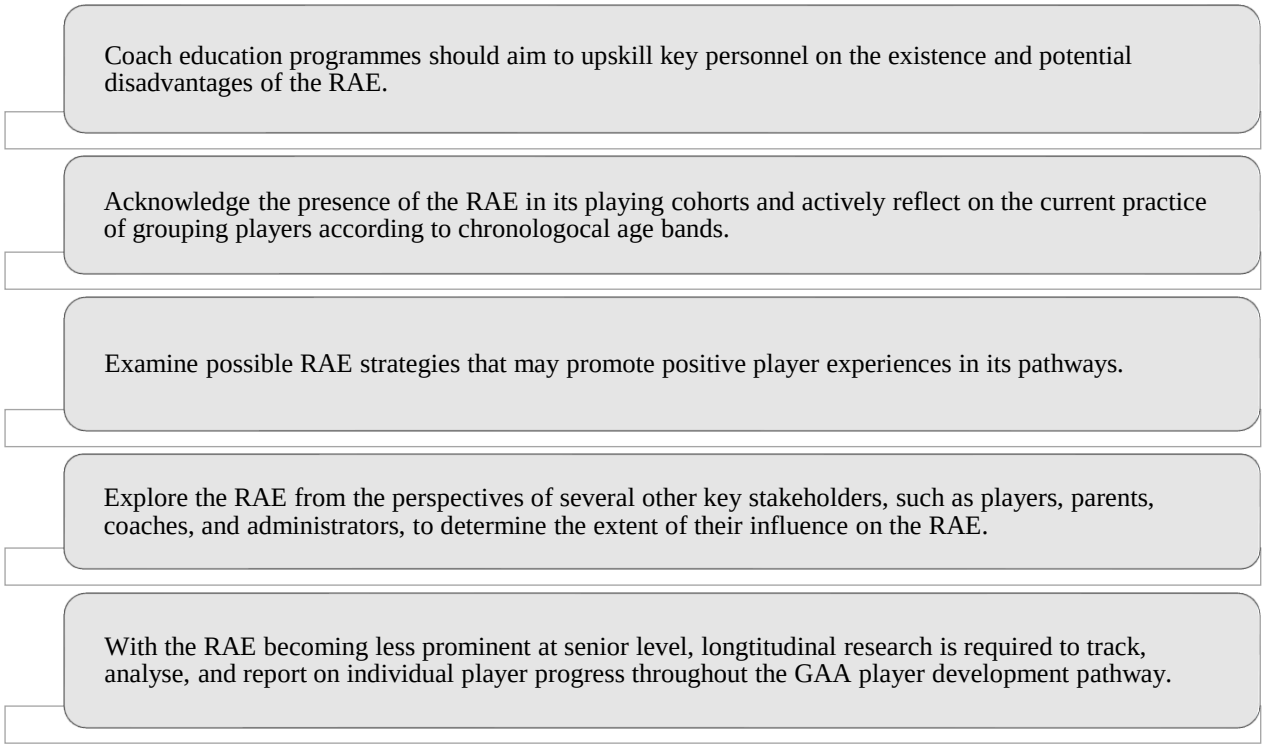
Cohort	BQ1 (%)	BQ2 (%)	BQ3 (%)	BQ4 (%)	Total	χ^2 (df=3)	*P*	Cramer's V	Effect size	BQ1 vs. BQ4 OR (95% CI)
U14 TA	898 (28.8)	860 (27.6)	760 (24.4)	600 (19.2)	3118	55.784	0.004	0.08	Small	1.44 (1.25, 1.67)
U15 TA	1323 (30.9)	1196 (28.0)	1014 (23.7)	743 (17.4)	4276	157.731	0.005	0.11	Small	1.72 (1.52, 1.94)
U16 TA	1057 (32.1)	887 (26.9)	824 (25.0)	528 (16.0)	3296	158.957	0.003	0.13	Small	1.93 (1.67, 2.23)
U17 TA	504 (28.7)	522 (29.7)	412 (23.5)	317 (18.1)	1755	51.60	0.003	0.10	Small	1.53 (1.26, 1.86)
U14-U17 TA	3782 (30.4)	3465 (27.8)	3010 (24.2)	2188 (17.6)	12445	402.133	<0.001	0.10	Small	1.67 (1.55, 1.79)
Senior	2214 (25.3)	2255 (25.8)	2264 (25.9)	2019 (23.1)	8752	3.812	0.282	0.01	N/A	1.06 (0.97, 1.15)

BQ1: January – March, BQ2: April – June, BQ3: July- September, BQ4: October-December. χ^2 = chi-square value, df = degrees of freedom for χ^2. p-value = level of statistical significance for χ2.

Table 3. Higher- and lower-order themes describing participant perceptions of the RAE

High-order themes	Low-order themes	Sample quotations
RAE understanding	Awareness of implications	"*I have much more awareness of it now than I did when I was actually stuck in the middle of it, if that makes sense. It probably wasn't something that was really considered when I was coaching the U15/16/17 Academies*" (Coach 3).
	Emerging interest in topic	*"I would have read a bit on it over the last 12 months, and I have a fairly good understanding of it at this point"* " (Coach 2).
Selection criteria	Coaches judgement	"*It [selection] is probably the coaching eye, word of mouth, observation of players in their clubs and school environment. Would it be helpful to have an outline at various age levels? I think it would be because it is evolving all the time*" (TDL 2).
	Collaborative decisions	"*I don't think there is a selection criteria. I think it is a kind of collective where you work closely with your selectors but there is no criteria. You are just ticking the boxes for technical skills and athleticism mainly*" (Coach 2).
	Selection matrix	"*Would it be helpful to have an outline at various age levels? I think it would be because the thing [player development] is evolving all the time*" (TDL 2).
Player characteristics	Players ability	"*And it's just kind of all in terms of what we were looking for. Look at that age, you are looking for the better players in terms of ability*" (Coach 2).
	Recognition of characteristics	"*At 14/15/16 it's technical ability and tactical decision-making ability, team playability, coachability. And we go into the physical fitness a little bit, but if a guy is lacking this, we understand that we can get that done through the development process*" (TDL 1).

Figure 1. Future research directions for GAA stakeholders



Appendix A: Interview guide

Focus Group Interview Guide		
Question	**Probe**	**Purpose**
Introduction Please tell me about your coaching background. Past/ Current How many years Academy/ senior experience have you?	Length of time coaching/ employed in GAA? Experience of coaches Are we selecting or identifying players?	To place all future responses in context Establish current performance/coaching level
1. **How do you identify talented players for your team?**	Can they be measured? Why do you look for those traits?	Specific, preferably measurable, factors or attributes that coaches use to predict talent
2. **What attributes/ Characteristics do you look for when choosing players at U14 /U17/ Senior?**	Do you have a criteria? Who selects players? Are team selection decisions based on birthdate, height, weight, and/or strength?	Are coaches willing to sacrifice short term success for long term gain?
3. **Is there a prescribed criteria for selecting players in your County?**	Ongoing or immediate (ie trials)? Loyalty to players from U14-U17?	Is TID inclusive and offer many opportunities to progress to elite level
4. **How many selection opportunities (trials) do you hold at each age grade? How long do you need to observe an athlete for in order to identify them as talented?**	If so, does this affect selection for your team? Are you aware of the players Dates of Births in your squad?	Assess the prior knowledge of RAE in GAA coaches
5. **Is there an awareness of the relative age effect (RAE) among coaches?**	Is it necessary in your opinion?	