Malaysian Journal of Sport Science and Recreation
Vol. 21 . No. 2. 1-9, 2025.
DOI: https://doi.org/10.24191/mjssr.v21i2.6488

RELATIVE AGE EFFECT AMONG MALES FOOTBALL PLAYERS IN FIFA WORLD CUP 2022

Siti Aisyah Binti Ibrahim[1], *Zulkhairi Azam[2], Sufyan Zaki[3], Mohd Hanifa Sariman[4], Norasrudin Sulaiman[5] & Maisarah Shari[6]

[1] Faculty of Sports Science & Recreation,
Universiti Teknologi MARA Pahang Branch
26400 Bandar Tun Razak Jengka, Pahang, Malaysia

[2, 3, 4, 5, 6] Faculty of Sports Science & Recreation,
Universiti Teknologi MARA
40450 Shah Alam, Selangor, Malaysia

*Corresponding author's email: zulkhairiazam@uitm.edu.my

Published date: 15 September 2025

ABSTRACT

The relative age effect (RAE) in sports competition refers to the continuous imbalance in birth date distribution within an age cohort, which tends to put individuals born earlier in the year at advantage of being selected into sports. The rationale for this study is that most previous research has focused on youth team sports rather than senior team sports, particularly football, and considering that RAE does have a few conflicting results in football, thus the purpose of this study is to examine the presence of RAE among male football players participating in the FIFA World Cup 2022. The secondary data on the football players, including their nationality, name, age, birthdate, and the teams they played for at the FIFA World Cup 2022, was gathered from the official FIFA website. Thus, the players' birthdates would be divided into four quartiles (Q). The present study included a sample of (N=828) male football players of FIFA World Cup 2022, all of whom had professional experience and ranged within the age range of 18 to 40 years. Most of the previous research indicated that RAE was significant in sport performance. Nevertheless, in this finding, there was no significant RAE was found on overall RAE distribution ($p = 0.854$), between champion and lowest ranked team ($p = 0.092$), and qualification to the knockout stage ($p = 0.726$). However, there is overrepresentation of RAE was found on overall distribution football player where post-hoc evaluation proved that Q1 had the highest value ($n = 266$, $SR = 4.10$). Followed by the overrepresentation in Q2 on the champion team (Argentina). Meanwhile, there is overrepresentation of RAE in Q1 on disqualified team. In a nutshell, this analysis demonstrates the overrepresentation of RAE in elite international football tournament, highlighting the role of RAE in selection of players that maybe down to the factors of better physique and physiology than the late born.

Keywords: *relative age effect, FIFA World Cup, birth quartile, football, male*

INTRODUCTION

The Relative Age Effect (RAE) has been extensively studied over the decades and is widely recognized as a phenomenon that creates an imbalance in birth date distribution within an age cohort, often disadvantaging those born later in the year (Kalén et al., 2021; Musch & Grondin, 2001). RAE is commonly observed in various domains, particularly in youth sports selection, high-performance development (Arrieta et al., 2016; Folgado et al., 2021). In the context of sports, particularly football, RAE is often linked to early physical development advantages that provide some athletes with greater opportunities for selection and advancement. The classification of athletes into annual age groups, typically using January 1 as the standard cut-off date, leads to disparities in birth month distribution within a single selection year (S. Cobley et al., 2009; Stracciolini et al., 2016).

RAE is particularly significant in youth sports, where athletes born earlier within a selection year often demonstrate advanced physical development, including increased strength, coordination, and endurance (Jakobsson et al., 2021; Lidor et al., 2021). This early developmental advantage frequently leads to greater opportunities for selection, access to advanced training, and exposure to higher levels of competition, thereby facilitating superior skill acquisition and long-term athletic progression (Arrieta et al., 2016; S. Cobley et al., 2009; Folgado et al., 2021). Studies have shown that these differences can result in selection advantages and enhanced sport development opportunities, such as access to higher levels of competition, training, and coaching expertise, depending on an athlete's birthdate relative to the sport system's cut-off date (Brustio et al., 2018; Cumming et al., 2017). This advantage is evident across various sports disciplines, where athletes born earlier in the selection year are overrepresented in elite youth programs (Jakobsson et al., 2021; Sierra-Díaz et al., 2017). Consequently, the RAE contributes to a systemic bias that favors early-born athletes, providing them with developmental benefits that can have lasting impacts on their athletic careers (Baker et al., 2010; Till et al., 2010). Those who benefit from RAE are more likely to be identified as promising talents, receive specialized coaching, and gain access to elite sporting pathways. In addition, a study by Azam et al., (2024) on elite footballers revealing a notable trend of early-born players were being overrepresented across top European football leagues, and this effect is evident in the top league standings being occupied by early born footballers. Given that sports selection processes often prioritize immediate physical and technical ability, early-born athletes are more frequently identified as elite prospects, reinforcing the cycle of RAE advantages.

Although concerns regarding the fairness of RAE have been widely discussed, research also highlights its potential benefits in fostering competitive excellence and accelerating athletic development. Athletes who are selected at an early stage due to their physical maturity often gain greater exposure to high-performance training environments, which enables them to refine their technical abilities and tactical awareness at a faster rate than their younger counterparts as mentioned by Jones et al., (2018) and Kelly et al., (2020) in their findings. Additionally, early selection may lead to psychological benefits such as increased confidence, motivation, and resilience, which are crucial factors for long-term success (Gibbs et al., 2012; Yagüe et al., 2018). In physically demanding sports such as football, these cumulative advantages enhance an athlete’s ability to perform at an elite level, reinforcing the idea that early selection based on physical precocity can shape the trajectory of a player’s career which is evident among young academy football players in English and Germany youth leagues (Bradley et al., 2017; Götze & Hoppe, 2021).

Despite the well-documented advantages associated with RAE at the youth level, its impact at the professional stage remains a topic of debate. Some scholars argue that as athletes mature, factors such as skill acquisition, tactical intelligence, and experience become more significant determinants of success, thereby diminishing the influence of RAE (S. Cobley et al., 2009; Kirkendall, 2014). However, others suggest that the benefits gained from early selection persist throughout an athlete’s career, continuing to influence team composition and player success at the highest levels of competition (Rubajczyk & Rokita, 2018; Till et al., 2016). This debate is particularly relevant in football, a sport that is globally popular and highly competitive, where early selection and talent identification play a crucial role in career development.

While concerning RAE in its persistence at the highest levels of competition, particularly in prestigious tournaments such as the FIFA World Cup, still remains unclear. Some studies suggest that as players advance in their careers, the impact of RAE diminishes due to additional factors such as experience, skill development, and psychological adaptation (Baker et al., 2010; Schorer et al., 2009). However, it remains unknown whether the advantages gained in early career stages continue to shape player representation in elite competitions. To relate with elite competition, interestingly Azam et al., (2024) found that RAE was presence among top four European professional football leagues, with regards those leagues does have lots of international footballers participating FIFA World Cup. Additionally, limited research exists on whether RAE is more pronounced in teams that achieve greater success compared to those that underperform, particularly in distinguishing between teams that progress to the knockout stages and those eliminated early. Given the high-stakes nature of international football, understanding the extent to which RAE influences player composition, team selection, and overall performance in major tournaments is essential.

Therefore, this study aims to examine the presence of RAE among male professional footballers in the FIFA World Cup 2022, exploring its correlation with team success. Specifically, it seeks to determine whether RAE is more prevalent among teams that advance further in the tournament compared to those that are eliminated earlier. By investigating the relationship between birthdate distribution and competitive success, this research will provide valuable insights into the implications of RAE for talent identification, team composition, and fair selection processes in elite football.

METHODOLOGY

Participants

As for this study, the total number (N = 828) players that participated in FIFA World Cup are included. The players will be divided into two teams, which is the qualified (n = 415) and disqualified team (n = 413) from the knockout round of 16. Therefore, the champion team (Argentina) consists of (n = 26) as well as lowest team (Qatar) that consist of (n = 26). Priorly, this research project has been given approval by the university's research ethics committee.

Data collection and analysis

This study employs a purposive sampling technique, selecting all players who actively participated in the FIFA World Cup 2022, with a specific focus on their birthdate characteristics. The data used in this research are secondary in nature, obtained from the official FIFA World Cup 2022 website, which includes publicly available information such as name, age, date of birth, and nationality.

Data were manually entered into Microsoft Excel before being analysed using IBM Statistical Package for the Social Sciences (IBM SPSS) version 28.0. The chi-square test (X^2) was applied to examine disparities in the distribution of birth dates across quartiles (Q1, Q2, Q3, and Q4). Additionally, the same test was used to evaluate differences in birthdate distribution based on team performance (i.e., teams that qualified for the knockout stages versus those that were eliminated). A p-value of ≤ 0.05 was considered statistically significant for all analyses. To ensure the reliability of the chi-square goodness-of-fit test, a post-hoc analysis was conducted using standard residuals (SRs), calculated as $SR = (F - G) / \sqrt{G}$, where F represents the observed frequency and G represents the expected frequency. A standard residual value of ≥ 1.96 indicates a significant overrepresentation relative to the expected distribution, while a value of ≤ -1.96 signifies an underrepresentation.

RESULT AND DISCUSSION

According to the Table 1. shown the descriptive statistics of FIFA World Cup Football Player 2022, which is include (N = 828) that participated. Football players' ages range from 18 to 40 years, with an average of (M = 26.97) and a standard deviation of 9.260. Furthermore, there is four quartiles that been included in this study which is Quartile 1 is starting from January until March, then Quartile 2, April until June,

following Quartile 3, July until September and lastly Quartile 4, October until December.

Table 1.0 Descriptive Statistics of FIFA World Cup Football Player 2022

	Min	Max	Mean	SD
Nationality	1	32	16.50	9.260
Age	18	40	26.97	4.303
Quartile	1	4	2.30	1.117
(N=828)				

Looking at the Table 2, the Chi-square of fit test revealed a not significant of RAE X^2 (3, N = 828) = 78.762, p = 0.854, showing the presence of RAE on overall distribution football player. Post hoc evaluation proved that Quartile 1 had the highest value (n = 266, SR = 4.10). There was an underrepresentation of players that born in Q4 (n = 163) when a negative standard residual (SR= -3.06) was identified.

Table 2 Overall FIFA World Cup 2022 Football Players Distribution of by Birth Quartiles

Birth Quartiles	Observed (N)	Expected (N)	SR	P
Quartile 1	266	207	4.10	
Quartile 2	209	207	0.14	
Quartile 3	190	207	-1.18	
Quartile 4	163	207	-3.06	
N	828			0.854

Meanwhile in Table 3, the Chi-square of fit test showed a non-significant RAE X^2 (3, n = 52) = 6.442, p = 0.092, showing the percentage of distribution birth quartile on the champion (Argentina) and lowest ranked team (Qatar). Post hoc evaluation proved that Quartile 2 had the highest value (n = 10, SR = 1.37). There was underrepresentation of players that born Quartile 3 (n = 3) in the champion and lowest team when a negative standard residual (SR = -1.37) was identified the same.

Table 3.0 Distribution of Birth Quartile on Champion and Lowest Team

	Champion			Lowest			
Birth Quartiles	Observed (W)	Expected (W)	SR	Observed (L)	Expected (L)	SR	P
Quartile 1	9	6.5	0.98	9	6.5	0.98	
Quartile 2	10	6.5	1.37	3	6.5	-1.37	
Quartile 3	3	6.5	-1.37	8	6.5	0.59	
Quartile 4	4	6.5	-0.98	6	6.5	-0.20	
N	26			26			0.092

Results in Table 4 shown that X^2 (3, N = 828) = 1.314, p = 0.726, suggesting that there was no significant RAE on qualified and disqualified team after grouping matches concluded. Meanwhile players in the disqualified team that are born in Q4 (n = 79) were found to be underrepresented, which is the standard residuals (SR = -2.39), proven that the players in this quartile were significantly less than others.

Table 4 Distribution of Birth Quartile on Qualified and Disqualified Team (Knockout Stage)

	Qualified			Disqualified			
Birth Quartiles	**Observed (O)**	**Expected (O)**	**SR**	**Observed (D)**	**Expected (D)**	**SR**	**P**
Quartile 1	131	103.75	2.68	135	103.25	3.12	
Quartile 2	110	103.75	0.61	99	103.25	-0.42	
Quartile 3	90	103.75	-1.35	100	103.25	-0.32	
Quartile 4	84	103.75	-1.94	79	103.25	-2.39	
N	415			26			0.726

DISCUSSION

RAE Among Male Professional Football Players in the FIFA World Cup 2022

This study examined the presence and distribution of the RAE among male football players in the FIFA World Cup 2022. The results showed no statistically significant differences in birthdate distributions across quartiles ($\chi^2(3, N = 828) = 78.762$, $p = 0.854$), although a descriptive trend was observed with players born in the first quartile being marginally overrepresented. This pattern suggests that while RAE may have played a role during earlier developmental stages, its influence appears to diminish significantly at the elite senior level.

The reduced impact of RAE at this stage of competition can be attributed to a shift in performance determinants. At the senior level, athletic success is less contingent on early physical maturation and increasingly reliant on a range of complex attributes such as game intelligence, technical refinement, psychological resilience, and tactical adaptability. These qualities are typically acquired over years of sustained professional training and match exposure, gradually neutralising any initial advantages associated with birthdate (Ramos-Filho & Ferreira, 2021; Williams et al., 2020). Moreover, elite footballers often undergo comprehensive development programmes where the focus shifts from raw physicality to more nuanced competencies such as spatial awareness, decision-making under pressure, leadership, and team coordination (Baker et al., 2010). These factors play a pivotal role in determining playing time, role specialisation, and match impact, thereby overriding the relatively simplistic influence of relative age.

An important consideration is the level of refinement in talent identification systems at the senior level. Clubs and national teams participating in the World Cup typically employ advanced scouting and performance analytics that prioritise technical, tactical, and psychological parameters over physical proxies that may be more influential during youth selection (Till et al., 2010). This shift in selection criteria likely contributes to the dilution of RAE effects among senior professionals.

However, the current study's reliance on secondary data introduces certain limitations. The absence of variables such as playing position, match minutes, and international experience restricts a deeper understanding of the interplay between age distribution and performance outcomes. Additionally, without longitudinal tracking of players' developmental histories, it is difficult to determine whether early RAE-related advantages persist or are eventually compensated for by other attributes.

RAE in Champion and Lowest-Ranked Teams (Argentina & Qatar)

The comparative analysis of Argentina (champion) and Qatar (lowest-ranked) revealed no significant RAE ($\chi^2(3, N = 26) = 1.314$, $p = 0.726$). While Argentina's squad still exhibited a higher number of players born in the earlier months of the year, this did not translate into a statistically significant pattern. This reinforces

the idea that success at the highest level is more strongly influenced by tactical systems, experience, leadership, and match intelligence than by relative age alone.

Argentina's performance may instead be attributed to the presence of experienced players who possess not only high technical proficiency but also the psychological and tactical acumen developed through sustained exposure to international competitions. These non-RAE factors—such as team chemistry, strategic versatility, and situational decision-making—are essential in navigating the complexities of tournament play and often differentiate successful teams at the elite level (Ramos-Filho & Ferreira, 2021).

On the other hand, Qatar's team showed minimal variation across quartiles and no evidence of RAE. This may reflect different talent development structures, where selection mechanisms are influenced more by domestic training systems, international player recruitment policies, or developmental priorities rather than systemic birthdate-related biases. Nevertheless, due to the limited squad size and lower competitive ranking, these findings must be interpreted cautiously.

RAE and Team Qualification in the Knockout Stage

Analysis of the teams that progressed to the knockout stages versus those that did not also show no significant RAE effect ($\chi^2(3, N = 828) = 1.314$, $p = 0.726$). While disqualified teams had a relatively higher proportion of Q1 players, this distribution did not indicate a competitive advantage based on relative age. This again underscores the declining predictive power of RAE for team success at the highest levels of the sport.

Instead, qualification for the knockout stage is likely influenced by a combination of tactical cohesion, in-game adaptability, coaching strategy, and player synergy. Teams that advance tend to demonstrate efficient team communication, ability to execute complex game plans, and resilience under high-pressure scenarios—competencies developed through years of collective training and competition rather than derived from birthdate advantages (González-Víllora et al., 2015; Helsen et al., 2005).

Moreover, many top teams now incorporate sports science, video analysis, and psychological conditioning into their preparation processes. These non-age-related elements support player performance and contribute significantly to match outcomes, further marginalising any residual effects of RAE at the senior competitive level (Baker et al., 2010; Williams et al., 2020).

CONCLUSION

This study examined the presence and implications of the RAE among male professional football players participating in the FIFA World Cup 2022. The findings revealed no statistically significant RAE across the overall player population, including within the champion team (Argentina), the lowest-ranked team (Qatar), and between teams that qualified or did not qualify for the knockout stages. While minor descriptive trends suggested a slight overrepresentation of players born in the first quartile, these patterns did not translate into competitive advantages at the senior level.

The results support the growing consensus that the influence of RAE diminishes at elite levels of football, where selection and performance are increasingly shaped by non-age-related factors such as tactical intelligence, technical skill, psychological resilience, match experience and other related aspects. This study reinforces the need to shift research focus from RAE in isolation toward a more integrative understanding of the multifactorial determinants of success in professional sport.

Despite its contributions, the study is limited by its reliance on secondary data and the absence of contextual variables such as player position, match minutes, and career development pathways. Future research should adopt a longitudinal, multi-dimensional approach to better understand how RAE interacts with broader developmental and performance-related factors across different stages of an athlete's career.

ACKNOWLEDGEMENTS

The author would like to express sincere gratitude to the Universiti Teknologi MARA (UiTM) for its continuous academic support and ethical oversight throughout the conduct of this study. Special thanks are also extended to the FIFA World Cup 2022 organizers and official platforms for making player data publicly accessible, which enabled the completion of this research.

CONFLICT OF INTEREST

The authors declare that there are no conflicts of interest in this research.

AUTHORS' CONTRIBUTION

Siti Aisyah Binti Ibrahim was responsible for the conceptualization, methodology, data collection, writing of the original draft, and research administration. Zulkhairi Azam, as the supervisor and corresponding author, provided supervision, overall direction of the research, validation, and critical revisions through review and editing. Sufyan Zaki contributed to data analysis, literature review, and manuscript refinement. Mohd Hanifa Sariman played a role in refining the literature review, and data collection. Norasrudin Sulaiman was involved in data validation, and manuscript review. Maisarah Shari contributed to refining the data, and reviewing the final manuscript. All authors have read and approved the final version of the paper.

REFERENCES

Arrieta, H., Torres-Unda, J., Gil, S. M., & Irazusta, J. (2016). Relative age effect and performance in the U16, U18 and U20 European basketball championships. *Journal of Sports Sciences*, *34*(16), 1530–1534.

Azam, M., Saleh, M., Kassim, M., & Jasmani, P. (2024). Relative age effect in top European football leagues. *Jurnal Sains Sukan dan Pendidikan Jasmani, 13*(1), 1–8.

Baker, J., Schorer, J., & Cobley, S. (2010). Relative age effects: An inevitable consequence of elite sport? *Sportwissenschaft*, *40*(1), 26–30.

Bradley, B., Johnson, D., Hill, M., McGee, D., Kana-ah, A., Sharpin, C., Sharp, P., Kelly, A., Cumming, S. P., Malina, R. M., Reeves, M. J., Enright, K. J., Dowling, J., Roberts, S. J., Zuber, C., Zibung, M., Conzelmann, A., Cumming, S. P., Searle, C., … Guglielmo, L. G. A. (2017). Premier League academy soccer players' experiences of competing in a tournament bio-banded for biological maturation. *Journal of Sports Sciences*, *7*(2), 34–47.

Brustio, P. R., Lupo, C., Ungureanu, A. N., Frati, R., Rainoldi, A., & Boccia, G. (2018). The relative age effect is larger in Italian soccer top-level youth categories and smaller in Serie A. *PLoS ONE*, *13*(4), 1–12.

Cobley, S., Baker, J., Wattie, N., & McKenna, J. (2009). Annual age-grouping and athlete development. *Sports Medicine*, *39*(3), 235–256.

Cobley, S. P., Schorer, J., & Baker, J. (2008). Relative age effects in professional German soccer: A historical analysis. *Journal of Sports Sciences*, *26*(14), 1531–1538.

Cumming, S. P., Lloyd, R. S., Oliver, J. L., Eisenmann, J. C., & Malina, R. M. (2017). Bio-banding in sport: Applications to competition, talent identification, and strength and conditioning of youth athletes. *Strength and Conditioning Journal*, *39*(2), 34–47.

De Subijana, C. L., & Lorenzo, J. (2018). Relative age effect and long-term success in the Spanish soccer and basketball national teams. *Journal of Human Kinetics*, *65*(1), 197–204.

Delorme, N., Boiché, J., & Raspaud, M. (2010). Relative age effect in elite sports: Methodological bias or real discrimination? *European Journal of Sport Science*, *10*(2), 91–96.

Folgado, H., Bravo, J., Quintas, A., Raimundo, A., & Gonçalves, B. (2021). Relative age effect in physical fitness of south Portugal students between 10 and 18 years old. *International Journal of Environmental Research and Public Health*, *18*(11).

Gibbs, B. G., Jarvis, J. A., & Dufur, M. J. (2012). The rise of the underdog? The relative age effect reversal among Canadian-born NHL hockey players: A reply to Nolan and Howell. *International Review for the Sociology of Sport*, *47*(5), 644–649.

González-Víllora, S., Pastor-Vicedo, J. C., & Cordente, D. (2015). Relative age effect in UEFA Championship soccer players. *Journal of Human Kinetics*, *47*(1), 237–248.

Götze, M., & Hoppe, M. W. (2021). Relative age effect in elite German soccer: Influence of gender and competition level. *Frontiers in Psychology*, *11*(January), 1–8.

Helsen, W. F., Van Winckel, J., & Williams, A. M. (2005). The relative age effect in youth soccer across Europe. *Journal of Sports Sciences*, *23*(6), 629–636.

Hill, M., Scott, S., Malina, R. M., McGee, D., & Cumming, S. P. (2020). Relative age and maturation selection biases in academy football. *Journal of Sports Sciences*, *38*(11–12), 1359–1367.

Huertas, F., Ballester, R., Gines, H. J., Hamidi, A. K., Moratal, C., & Lupiáñez, J. (2019). Relative age effect in the sport environment. Role of physical fitness and cognitive function in youth soccer players. *International Journal of Environmental Research and Public Health*, *16*(16), 1–19.

Jakobsson, J., Julin, A. L., Persson, G., & Malm, C. (2021). Darwinian selection discriminates young athletes: The relative age effect in relation to sporting performance. *Sports Medicine - Open*, *7*(1).

Jones, B. D., Lawrence, G. P., & Hardy, L. (2018). New evidence of relative age effects in "super-elite" sportsmen: a case for the survival and evolution of the fittest. *Journal of Sports Sciences*, *36*(6), 697–703.

Kalén, A., Lundkvist, E., Ivarsson, A., Rey, E., & Pérez-Ferreirós, A. (2021). The influence of initial selection age, relative age effect and country long-term performance on the re-selection process in European basketball youth national teams. *Journal of Sports Sciences*, *39*(4), 388–394.

Kelly, A. L., Wilson, M. R., Gough, L. A., Knapman, H., Morgan, P., Cole, M., Jackson, D. T., & Williams, C. A. (2020). A longitudinal investigation into the relative age effect in an English professional football club: exploring the 'underdog hypothesis.' *Science and Medicine in Football*, *4*(2), 111–118.

Kirkendall, D. T. (2014). The relative age effect has no influence on match outcome in youth soccer. *Journal of Sport and Health Science*, *3*(4), 273–278.

Lidor, R., Maayan, Z., & Arnon, M. (2021). Relative age effect in 14- to 18-year-old athletes and their initial approach to this effect—has anything changed over the past 10 years? *Frontiers in Sports and Active Living*, *3*(March), 1–12.

Lupo, C., Boccia, G., Ungureanu, A. N., Frati, R., Marocco, R., & Brustio, P. R. (2019). The beginning of senior career in team sport is affected by relative age effect. *Frontiers in Psychology*, *10*(June), 1–6.

Musch, J., & Grondin, S. (2001). Unequal competition as an impediment to personal development: A review of the relative age effect in sport. *Developmental Review*, *21*(2), 147–167.

Patel, R., Nevill, A., Cloak, R., Smith, T., & Wyon, M. (2019). Relative age, maturation, anthropometry and physical performance characteristics of players within an elite youth football academy. *International Journal of Sports Science and Coaching*, *14*(6), 714–725.

Ramos-Filho, L., & Ferreira, M. P. (2021). The reverse relative age effect in professional soccer: an analysis of the Brazilian National League of 2015. *European Sport Management Quarterly*, *21*(1), 78–93.

Rubajczyk, K., & Rokita, A. (2018). The relative age effect in Poland's elite youth soccer players. *Journal of Human Kinetics*, *64*(1), 265–273.

Schorer, J., Cobley, S., Büsch, D., Bräutigam, H., & Baker, J. (2009). Influences of competition level, gender, player nationality, career stage and playing position on relative age effects. *Scandinavian Journal of Medicine and Science in Sports*, *19*(5), 720–730.

Sierra-Díaz, M. J., González-Víllora, S., Pastor-Vicedo, J. C., & Serra-Olivares, J. (2017). Soccer and relative age effect: A walk among elite players and young players. *Sports*, *5*(1).

Stracciolini, A., Friedman, H. L., Casciano, R., Howell, D., Sugimoto, D., & Micheli, L. J. (2016). The relative age effect on youth sports injuries. *Medicine and Science in Sports and Exercise*, *48*(6), 1068–1074.

Till, K., Cobley, S., Wattie, N., O'Hara, J., Cooke, C., & Chapman, C. (2010). The prevalence, influential factors and mechanisms of relative age effects in UK Rugby League. *Scandinavian Journal of Medicine and Science in Sports*, *20*(2), 320–329.

Till, K., Jones, B. L., Cobley, S., Morley, D., O'Hara, J., Chapman, C., Cooke, C., & Beggs, C. B. (2016). Identifying talent in youth sport: A novel methodology using higher-dimensional analysis. *PLoS ONE*, *11*(5), 1–18.

Williams, A. M., Ford, P. R., & Drust, B. (2020). Talent identification and development in soccer since the millennium. *Journal of Sports Sciences*, *38*(11–12), 1199–1210.

Yagüe, J. M., de la Rubia, A., Sánchez-Molina, J., Maroto-Izquierdo, S., & Molinero, O. (2018). The relative age effect in the 10 best leagues of male professional football of the union of European football associations (UEFA). *Journal of Sports Science and Medicine*, *17*(3), 409–416.