The relative age effect in volleyball: a systematic review

El efecto de la edad relativa en el voleibol: una revisión sistemática

Authors

Leonardo Egerland Souto [1]
Mônica Cristina Flach [1]
Gabriel Costa de Souza [1]
Mariana Klauck Beirith [1]
Alexandra Folle [1]

[1] Universidade do Estado de Santa Catarina (UDESC) – Santa Catarina - Brasil

Autor de correspondencia:
Leonardo Egerland Souto
leonardo.souto06@edu.udesc.br.

Received: 06-08-25
Accepted: 23-01-26

How to cite in APA

Souto, L; E., Flach, M. C., Costa de Souza, G., Klauck M.; B & Folle, A. (2026). The relative age effect in volleyball: a systematic review. *Retos*, *77*, 954-966. https://doi.org/10.47197/retos.v77.117348

Abstract

Introduction: The Relative Age Effect (RAE) is a recurring phenomenon in the training process of athletes in various sports, both team and individual, where it is presumed that those born at the beginning of the competition period have an advantage in sports performance compared to those born at the end of that same period.
Objective: To map the scientific production on the relative age effect in volleyball.
Methodology: The search was conducted in the Web of Science, Scopus, ProQuest, Ebsco, Sportdiscus, SciELO, and Lilacs databases. The information was analyzed by categorizing the athletes' attributes and the results published in the studies, using NVivo software. Nine articles published on RAI in volleyball that met the eligibility criteria were mapped.
Results: The information revealed that most studies investigated male and female athletes together, in the adult category or in categories close to adulthood, as well as in national competitions.
Discussion: The main results published in articles on the Relative Age Effect (RAE) in volleyball revealed that, when observing the presence of athletes born in different birth quartiles, for males, a greater representation of athletes born in the 1st and 2nd quartiles was identified, while for females, no statistically significant differences were found, but when they were, they also showed an overrepresentation of athletes born in the 1st quartile.
Conclusion: From the results of this review, it was possible to conclude that the topic of RAI in volleyball has not had a significant number of publications in the last 10 years (nine studies).

Keywords

Age distribution; knowledge production; relative age effect; sport.

Resumen

Introducción: El Efecto de la Edad Relativa (EAR) es un fenómeno recurrente en el proceso de entrenamiento de los atletas en varios deportes, tanto de equipo como individuales, donde se presume que los nacidos al inicio del período de competencia tienen una ventaja en el rendimiento deportivo en comparación con los nacidos al final de ese mismo período.
Objetivo: Mapear la producción científica sobre el efecto de la edad relativa en voleibol.
Metodología: La búsqueda se realizó en las bases de datos Web of Science, Scopus, ProQuest, Ebsco, Sportdiscus, SciELO y Lilacs. La información se analizó categorizando los atributos de los atletas y los resultados publicados en los estudios, utilizando el software NVivo. Se mapearon nueve artículos publicados sobre el EAR en voleibol que cumplieron con los criterios de elegibilidad.
Resultados: La información reveló que la mayoría de los estudios investigaron atletas masculinos y femeninos en conjunto, en la categoría adulta o en categorías cercanas a la edad adulta, así como en competiciones nacionales.
Discusión: Los principales resultados publicados en artículos sobre el Efecto de la Edad Relativa (RAE) en voleibol revelaron que, al observar la presencia de atletas nacidos en diferentes cuartiles de nacimiento, para los hombres se identificó una mayor representación de atletas nacidos en el 1.er y 2.º cuartil, mientras que para las mujeres no se encontraron diferencias estadísticamente significativas, pero cuando las hubo, también mostraron una sobrerrepresentación de atletas nacidos en el 1.er cuartil.
Conclusión: A partir de los resultados de esta revisión, fue posible concluir que el tema del RAI en voleibol no ha tenido un número significativo de publicaciones en los últimos 10 años (nueve estudios).

Palabras clave

Distribución etaria; producción de conocimiento; efecto de la edad relativa; deporte.

Introduction

In the process of sports performance, athletes go through a long process of development, which begins with specialization in a chosen sport (Goodway et al., 2013). The athlete's development process is influenced by external factors such as the influence of coaches (Musch & Grondin, 2001), parents (Hancock et al., 2013), environmental factors such as the sports and cultural system, as well as individual factors such as maturation and date of birth. These factors have an impact on athletes' sporting performance, especially individual factors such as maturation and date of birth, in which most sports group athletes by age group, with different biological and chronological ages within the same category (Musch & Grondin, 2001; Cobley et al., 2009; Hancock et al., 2013; Lago-Fuentes et al., 2020).

Relative Age is seen as the difference in age between individuals of the same age group, grouped on an annual or biennial basis, commonly seen in sports competitions (Wattie et al., 2008; Lemonye et al., 2023; Pérez-González et al., 2021; Tascioglu et al., 2023). In this division, athletes born from January to December end up remaining at the same cut-off point, thus observing possible discrepancies in physical, mental and psychological development, depending on the month of birth, which could turn into possible advantages in sports performance for athletes born in the first months of the year, compared to those born in the last months. The disparity in athletes' birth months and the resulting effect on sport performance is termed the Relative Age Effect (RAE) (Musch & Grondin, 2001; Wattie et al., 2008; Cobley et al., 2009; Hancock et al., 2013).

The effect occurs in almost all sports competitions, giving an advantage to those born earlier in the same year in the same category (Babic et al., 2022). RAE manifests itself during the period of greatest growth in adolescence, in which variability in maturation between individuals occurs in an individualized way and in a slower and more uniformly dependent manner (Cular et al., 2024). The overrepresentation of relatively older athletes is physiologically explained by advanced biological maturation, which suggests that mature athletes exhibit more strength, speed, flexibility and technique, revealing a greater likelihood of selection for competitions in different sport events (Sarmento et al., 2018). Although an age difference of less than 12 months may have little relevance for adults, it can be significant in children (Helsen et al., 2005).

Early maturation can be mistaken for talent, and might be biased by false perceptions of parents, athletes and coaches (Hancock et al., 2013), which leads to a selection of players for competitions. Across competitive categories ranging from U13 to senior levels. Kearney et al. (2018) revealed that track and field athletes show a stronger RAE in younger categories, with its magnitude decreasing over time. Even though RAE tends to fade or have less impact in adult categories (Kearney et al., 2018; Lorenzo-Calvo et al., 2021), there is evidence of its presence in adult categories among various sports, revealing a complex and nuanced nature of the effect across the athletes' developmental stages (Brustio et al., 2018; Kearney et al., 2018; Joyner et al., 2020).

Furthermore, RAE in sport can be a challenge for younger athletes to continue in sports practice. Penna and Moraes (2010) highlight that players born in the last quarters abandon futsal practice significantly more than those born in the first quarters of the year. Research among football studies have found an overrepresentation of those born in the first months of the year in youth categories (Castellano et al., 2024), while futher investigations demonstrated a greater presence of stronger, taller, and relatively older players in certain game positions in the sport (Sarmento et al., 2018).

With the advancement of research on the subject, systematic reviews have been conducted with the aim of analyzing the results found on RAE in different sports, whether in team sports in general (Smith et al., 2018; Rubia et al., 2020; Ortega et al., 2021; Silva et al, 2022; Babic et al., 2022) or specific sports, such as swimming (Piloupas & Telles, 2020; Lorenzo-Calvo et al., 2021), football (Sarmento et al., 2018; Pérez-González et al., 2021), basketball (Riaza et al., 2020; Taşçıoğlu et al., 2023) and futsal (Mendes et al., 2022). These reviews have found that research as a whole has seen an over-representation of athletes born at the beginning of the year, benefiting older athletes in individual performances and teams with a greater number of these athletes in team performances.

In general, the studies by Rubia et al. (2020), Lorenzo-Calvo et al. (2021) and Babić et al. (2022) are similar in showing that RAE influences the performance of team sports athletes, short-term team performance and long-term individual performance (sports career), respectively. In swimming, in analyses

of variables such as gender, age group, competitive category and level of competition, the review by Lorenzo-Calvo et al. (2021) found that the impact on males has been greater than on females, reaching as far as the U12 category in national-level competitions.

Based on the theoretical support presented around systematic reviews of the topic, to date, no systematic reviews publications have been identified that focus on verifying RAE in relation to volleyball athletes' specific characteristics. Although the ones that have been conducted in both general and specific in other sports, their limitations highlight the need for further investigation across different settings within the same sport (Rubia et al. 2020), as well as analyses considering athletes' practice level and gender (Babić et al., 2022), in order to clarify to what extent volleyball, one of the world's most popular sports (Varmus et al., 2022), is influenced by these players' characteristics and their birth.

Against this backdrop, this study aims to map scientific production on the effect of relative age in volleyball, identifying the year of publication of the articles, competitive category and nationality of the athletes investigated, as well as the results associated with the Relative Age Effect and the secondary variables analyzed in the studies.

Method

The systematic review was conducted using the recommendations of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses protocol (PRISMA 2020 - Page et al., 2021). Theoretical research of the systematic review type is a methodological approach that enables a broad inclusion of studies that compile theoretical advances on a given topic (Ato et al., 2013).

Sources of data and research

Articles were searched in the following electronic databases: Web of Science; Scopus; Ebsco - SportDiscuss, Scientific Electronic Library On-line (Scielo) and Latin American and Caribbean Literature in Health Sciences (Lilacs). The sources of information were systematically searched in February 2024, using operators and descriptors in: English - "RAE" OR "relative age" OR "influence of age" OR "birthdate" OR "age effect" AND volleyball; Portuguese - "idade relativa" OR "efeito da idade relativa" AND voleibol; Spanish - "efecto de la edad relativa" OR "edad relativa" AND vóleibol.

The methodological validation of the studies was also carried out independently by two evaluators, using the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) checklist, which originally has 22 items that seek to ensure the completeness and careful description of observational studies (Malta et al., 2010). For this study, an adapted version of the 17-item list was utilized, as suggested and utilized in other literature systematic reviews in sport (Smith *et al.*, 2018; Rubia *et al.*, 2020; Maciel et al., 2021), including the title and abstract (item 1), the introduction (items 2 and 3), the methods (4-8 and 10-12), the results (items 13, 14 and 16) and the discussion (items 18-20). The studies were classified according to the following cut-off points: A (>80% high); B (50% to 80% moderate); and C (<50% low) (Elm et al., 2007). The cut-off points were obtained by adding up the score assigned to each item: 0 (does not meet); 1 (meets).

Data synthesis and analysis

The analysis and selection of studies was carried out independently by two researchers. When differences were observed in the screening, a third investigator mediated and helped to check that the eligibility criteria had been applied, which only six of the 861 articles needed mediation. The eligibility criteria involved the time frame of the last decade (2014 to 2023) and languages (Spanish, English, Portuguese), as well as the Participate, Exposure, Comparison, Outcome, Study (Pecos) strategy, highlighted in Figure 1:

Figure 1. Inclusion and exclusion criteria applied during the study selection process

		Inclusion	Exclusion
P	Participate	Volleyball athletes.	Non-athletes, other sports athletes.
E	Exposure	Training, sports performance.	Sport practice for education, leisure of health.
C	Comparison	Competitive categories from youth to professional; male and female athletes; different nationalities.	Does not apply.
O	Outcome	The relative age effect, in comparison with personal variables (sex, age), sportive (playing position, level and time of sports experience), anthropometric (stature, weight) and performance (jump, games played, points, ace, blocks, attack, trophies and awards, selection to state/national team).	Relative age effect in other sports.
S	Study	Cross-sectional and quantitative studies.	Theoretical studies; randomized studies; instrumental studies; qualitative studies.

Font: the authors, 2025.

The search for articles in the databases, the application of the search equations and the filters used (type of document, language, date of publication, theme, keywords) was carried out in February 2024. The articles found were exported to the Rayyan program, where duplicate studies were eliminated. After this, the three stages of manual selection of the articles began: reading the titles; reading the abstracts; and reading the full texts, based on the established eligibility criteria.

The extracted articles were organized and archived in the Rayyan application, while their characteristics were categorized in the QSR NVivo PRO software (version 12):

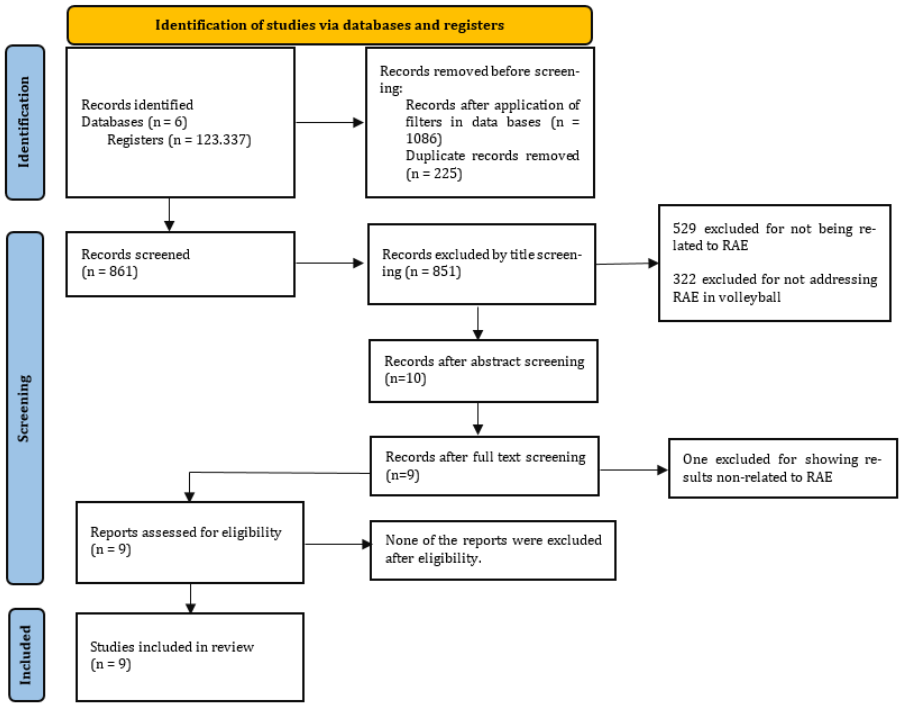
- Year of publication: 2018, 2020, 2021, 2022;
- Gender: female, male, female-male;
- Category: U14, U15, U16, young Junior, Junior, university (adult), adult;
- Nationality: Brazil, Canada, Spain, Greece, Poland, international;
- Birth period: quarter (quartile);
- Secondary variables: anthropometric, physiological, physical fitness, collective performance, individual performance indicators, academic time, playing positions;
- Level of competition: national, international;
- Methodological validity: high.

The results presented by the studies were analyzed by creating categories and subcategories of analysis.

Study flow through the review

The process of selecting studies is shown in the PRISMA flowchart (Figure 2):

Figure 2. PRISMA flow diagram of the study selection process for the systematic review



Font: the authors, 2025.

Results

Characterization of the included studies

The articles included are presented and characterized in Table 1. The authors, the year of publication of the article, the gender of the groups of athletes analyzed, the sports category, the country where the research was carried out, the level of the competition played and the methodological validity of the articles are highlighted. The texts were organized and arranged in chronological order, making it easier to interpret and present them longitudinally.

Table 1. Information from the articles tracked on RAE in volleyball

N	Referece	Sex	Category	Country/Context	Level	Variables	Validity
1.	Parma & Penna (2018)	F/M	Adult	Brazil	National	No secondary variables	High
2.	Campos et al. (2020)	F	U18	International	International	Team ranking and continent	High
3.	Safranyos et al. (2020)	F/M	University	Canada	National	Academic time	High
4.	Solon & Silva (2020)	M	Adult	International	International	Volleyball fundamentals	High
5.	Ntozis et al. (2021)	F	U14 & U15	Greece	National	Anthropometric and physical fitness	High
6.	Sliwa et al. (2021)	M	Young Junior & Junior	Poland	National	Anthropometric and physical fitness	High
7.	Albaladejo-Saura et al. (2022)	F/M	U16	Spain	National	Maturation, kinanthropometric, physical fitness, time of experience, and performance	High
8.	Castro et al. (2022a)	F/M	Adult	Brazil	National	No secondary variables	High
9.	Castro et al. (2022b)	F/M	Adult	Brazil	National	Playing position performance	High

Note: M-Male; F-Female.

Table 2 shows the main results published in the articles on RAE in volleyball, according to their objectives. The information gathered revealed that, when looking at the presence of athletes born in the different birth quartiles, for males (Parma & Penna, 2018; Safranyos et al., 2020; Sliwa et al., 2021; Castro et al, 2022a;b), studies have identified a greater representation of athletes born in the 1st and 2nd quartiles, while for females no statistically significant differences have been found (Parma & Penna, 2018; Ntozis et al., 2021; Castro et al., 2022a;b), but when differences have been found for females, they have shown an over-representation of athletes born in the 1st quartile (Campos et al., 2020; Safranyos et al., 2020; Castro et al., 2022a). The study that investigated the final ranking of the teams found an over-representation of athletes born in the 1st quartile in the first rankings (Campos et al., 2020), while the study that compared RAE with academic time, found for both genders an over-representation of athletes born in the first two quartiles in regular study time (Safranyos et al., 2020). When looking at anthropometric and kinanthropometric characteristics, most studies have found no statistically significant differences between birth quartiles (Solon & Silva, 2020; Ntozis et al., 2021).

Table 2. Summary of the results published in the articles screened on RAE in volleyball

N	Reference	Objective	Results
1.	Parma & Penna (2018)	To evaluate the presence of RAE in elite Brazilian volleyball.	F: no RAE M: RAE = ↑ athletes born in the 1st quartile; ↓ athletes born in the 3rd and 4th quartiles
2.	Campos et al. (2020)	Determine the differences between the relative ages, the rankings of the countries in the championship and the continents taking part in the Volleyball World Cup.	RAE = Teams with ↑ athletes born in the 1st semester obtained better results RAE = America, Asia, Europe No RAE = Africa
3.	Safranyos et al. (2020)	To examine the moderating effects of academic time on RAE in university volleyball athletes.	M: RAE = ↑ athletes born in the 1st and 2nd quartiles (5 out of 8 years investigated) ↓ 3rd and 4th quartiles (5 out of 8 years investigated) F: RAE = ↑ athletes born 2nd quartile (5 out of 8 years investigated) ↓ 4th quartile (6 out of 8 years investigated) M: RAE = ↑ athletes born in the 1st and 2nd quartiles were within the regular academic time ↓ athletes born in the 3rd and 4th quartiles were within the regular academic time F: RAE = ↑ athletes born in the 1st and 2nd quartiles who were within the regular academic time and ↓ athletes born in the 4th quartile who were within the regular academic time (7 out of 8 years investigated)
4.	Solon & Silva (2020)	To see if the date of birth, by quartile, influences the height of the players, the attack range, the blocking and the score of the athletes taking part in the Olympics.	F and M: No RAE = athletes behind academically No RAE = height, attack range, blocking and scoring
5.	Ntozis et al. (2021)	To determine possible quarterly differences in anthropometric and psychological characteristics in groups of 13- and 14-year-old volleyball players.	No RAE = anthropometric and physiological characteristics
6.	Sliwa et al. (2021)	To compare the distribution of birth dates by quartile with anthropometric characteristics and jumping tests of young junior and junior volleyball players.	RAE = ↑ athletes born in the 1st and 2nd quartile; ↓ athletes born in the 4th quartile RAE = athletes born in the 4th quartile ↓ attack jump and body mass
7.	Albaladejo-Saura et al. (2022)	To analyze differences in kinatropometric and physical fitness variables in relation to the relative age of volleyball athletes.	General No RAE = Maturity status, kinanthropometric variables, physical fitness tests Comparison between the sexes RAE = Maturity status, kinanthropometric variables (less biiliocrestal diameter, mesomorphy, fat mass and BMI) and physical fitness tests [does not explain differences by quartile].
8.	Castro et al. (2022a)	To investigate the prevalence of RAE in Brazilian Superliga A and B athletes.	General M: RAE = ↑ athletes born in the 1st quartile; ↓ athletes born in the 2nd, 3rd and 4th quartiles. F: RAE = ↑ athletes born in the 1st and 2nd quartiles; ↓ athletes born in the 4th quartile. By Superliga F: A - no RAE. F: B - RAE = ↑ athletes born in the 1st quartile; ↓ athletes born in the 4th quartile. M: A - RAE = ↑ athletes born in the 1st quartile; ↓ athletes born in the 3rd and 4th quartiles

			M: B - RAE = ↑ athletes born in the 1st quartile; ↓ athletes born in the 4th quartile. General M: RAE = ↑ athletes born in the 1st and 2nd quartiles; ↓ athletes born in the 3rd and 4th quartiles. F: no RAE By playing position M: Pointers: RAE = ↑ players born in the 1st quartile; ↓ players born in the 3rd and 4th quartiles; Opponents: RAE = ↑ players born in the 1st and 2nd quartiles; ↓ players born in the 4th quartile; Centers: RAE = ↑ players born in the 1st and 2nd quartiles; ↓ players born in the 3rd quartile. M: No RAE = Libero and Lifter. F: no RAE Performances variables (low and high) Low - M: RAE = ↑ players born in the 1st and 2nd quartiles; ↓ players born in the 4th quartile (attack points, aces and block points); ↑ players born in the 1st and 2nd quartiles; ↓ players born in the 3rd quartile (aces) High - M: RAE = ↑ players born in the 1st and 2nd quartiles; ↓ players born in the 3rd and 4th quartiles (attack points, aces and block points). Low and High - F: No RAE
9.	Castro et al. (2022b)	To investigate the prevalence of RAE in elite Brazilian volleyball (Superliga A), taking into account playing position, gender and performance.	

Note: RAE = Relative Age Effect; M = Male; F = Female; ↑ = over-representation; ↓ = under-representation.

When comparing the RAE with playing positions and performance indicators, one study found a predominance of athletes born in the 1st quartile among most of the positions and game actions analyzed, for male athletes (Castro et al., 2022b). In most studies (Parma & Penna, 2018; Safranyos et al., 2020; Sliwa et al., 2021; Castro et al. 2022a; Castro et al., 2022b), when significant statistical differences were found, both in the presence of athletes and in comparison, with other variables, the under-representation was for athletes born in the fourth quartile.

The data published in the articles selected for this review suggest an over-representation of male athletes, born in the 1st quartile and 2nd quartile, when a positive result for the effect on this sex is observed (Parma & Penna, 2018; Sliwa et al., 2021; Castro et al., 2022a; Castro et al., 2022b). In the case of female athletes, Campos et al. (2020) found a higher representation in athletes born in the 1st and 2nd quartiles of the year and Castro et al. (2020a) identified only in the women's Superliga B sample a higher representation of athletes in quartile 1, while Safranyos et al. (2020) found over-representation of both sexes in the same study.

In this systematic review, most of the studies that looked at men found evidence that men's volleyball is biased by RAE. Anthropometric variables, sports performance, playing positions and the representation of athletes in competitions, depending on their date of birth, seem to favor athletes born in the first months of the year (Parma & Penna, 2018; Safranyos et al., 2020; Albaladejo-Saura et al., 2022; Castro et al., 2022a; Castro et al., 2022b). However, one study found no effect in men's competitions in the Olympics (Solon & Silva, 2020), an international competition that found no significant difference in anthropometric and sports performance variables between athletes.

In women's adult categories (Parma & Penna, 2018; Castro et al, 2022a; Castro et al., 2022b), the RAE was not apparent at elite levels in volleyball, diverging from Smith et al. (2018), who verified the presence of the effect in the same category in other sports. One study looked at women's university volleyball and found a greater representation of athletes born in the first few months of the year (Safranyos et al., 2020). Due to the lack of studies focusing on RAE in women's volleyball, in the youth and adult categories within the same sporting context, i.e., level of competition, sporting category and nationality, it is not possible to define a trend for the presence or absence of the relative age effect in women's volleyball.

When individual performances are analyzed, controversial results have been found. With regard to adult males, Castro et al. (2022b) and Solon & Silva (2020) found divergent results for the same age group and sex. The first found RAE affecting individual scoring performances in the Brazilian national volleyball championship, while the second found no significant differences for the same variables, but at a higher (international) sporting level, in the Olympics. In the available literature, it has been observed that individual performance has been influenced by RAE in different age groups. At a national level, Riaza et al. (2020) and Lorenzo-Calvo et al. (2021) present similar results to Castro et al. (2022b), in which performance was affected by the RAE. However, in sports categories below those studied in the

context of volleyball, which were centered on adult categories, Lorenzo-Calvo et al. (2021) points out that RAE does not continue to progress in sports performance as the age group increases, which tends to strengthen the evidence of Solon & Silva (2020) and differs from the evidence of Castro et al. (2022a) and Castro et al. (2022b).

Discussion

The main goal of this research was to analyze the scope of scientific production regarding the RAE in volleyball. The analysis involved characterizing the articles by publication date, the competitive category and nationality of the samples, and synthesizing both the RAE's outcomes and the additional variables scrutinized within the included studies. With regard to the country or context of the research included in this review, there were slightly more studies carried out in Brazil (3) than in other countries. Similarly, Brazil was the third country with the most publications on RAE in youth athletes from various sports (Silva et al., 2022), revealing the scale of Brazilian scientific production on the subject of RAE. In terms of competitive categories, there was a predominance of research with athletes from adult categories or age groups close to this, unlike the reviews by Sarmento et al. (2018) and Smith et al. (2018), in football, by Rubia et al. (2020), with team sports, by Riaza et al., (2020), in basketball and by Lorenzo-Calvo et al. (2021), in swimming, which identified that the research focused on the age groups of 15 to 19 years, the post-adolescence.

The over-representation of athletes that belong to the 1st and 2nd quartile was identified in most of studies in this review. This finding corroborates with the scientific literature, as other systematic reviews on RAE such as Sarmento et al. (2018), Smith et al. (2018), Riaza et al. (2020), Lorenzo-Calvo et al. (2021), Ortega et al. (2021) and Rubia et al. (2020) also found an over-representation of athletes born in the first half of the year, in the first two birth quartiles. When analyzing the participants' sex, an over-representation of male atlhetes was identified in the present review. This evidence corroborates with the findings of systematic reviews available in the literature that analyzed researches with athletes from various sports (Rubia et al., 2020; Ortega et al., 2021; Babić et al., 2022, Silva et al., 2022) or with athletes from a single sport (Sarmento et al., 2018; Riaza et al., 2020; Lorenzo-Calvo et al., 2021). These reviews have identified a greater predominance of RAE for male athletes (Rubia et al., 2020; Lorenzo-Calvo et al., 2021; Riaza et al., 2020; Babić et al., 2022), in contrast to women's sport, whose sporting performance tended not to be so affected by RAE (Rubia et al., 2020).

The dependent variable most analyzed in the studies found in other systematic reviews (basketball - Riaza et al., 2020; swimming - Lorenzo-Calvo et al., 2021) refers to the specific performance indicators of the sport, which differs from the findings in the context of volleyball, in this review, which revealed a focus on anthropometric variables and performance indicators. Sarmento et al. (2018), in football, also found a wide range of variables analyzed in comparison with the RAE, most of which were: anthropometric and physiological; playing position; performance indicators; experience of the players; and team classification.

Sports performance was classified as collective (team ranking) or individual (score per player and physical fitness parameters influencing the ability to score) which can be affected by RAE. In this review, only one study was found that analyzed collective performance in volleyball, in the U18 category of the women's world championship (Castro et al., 2020) and verified the presence of RAE, which corroborates two other articles included in the systematic review of Riaza et al. (2020) in basketball, which found, at the same competitive level and age group (post-adolescence), RAE affecting female collective performance in competitions (Arrieta et al., 2016; Vegara-Ferri et al., 2019). In volleyball, Sliwa et al. (2024) also showed RAE affecting male collective performance at the same competitive level and age group, which may represent a trend in the athlete selection process. On the other hand, the review by Riaza et al. (2020) in basketball did not indicate any influence of RAE in the complete sample of studies included in their review that analyzed RAE in women's collective basketball performance. This review found only one article on the impact of RAE on team performance, with the population analyzed with a specific profile in terms of gender, category and level analyzed, not allowing the identification of a positive or negative trend of RAR on team performance in the context of volleyball. The lack of evidence on this variable reveals the need for more studies on collective performance and RAE in volleyball analyzing both sexes.

There have been few studies on the individual performance of male and female volleyball players, as well as those on collective performance. Regarding individual performance, different competitive levels in the highest age group have been analyzed in volleyball, where theoretically the RAE tends not to affect the athletes' performance, given that the athletes have already gone through the entire development period in the sport (Lorenzo-Calvo et al., 2020). When the RAE is compared with the specifics of the sport (playing position/sides) and performance indicators, similar results are found in the literature of systematic reviews (Riaza et al., 2020; Lorenzo-Calvo et al., 2021; Sarmento et al., 2018). The reviews found research verifying not only the presence of RAE in competition, but the effect between playing positions/swimming styles, in athletes with higher attributions of cognitive (decision-making, strategic thinking), physical (height, weight, wingspan, body mass index), motor or neuromuscular (strength, power, precision) skills, for athletes born, for the most part, in the first six months of the year (Romann & Fuchslocher, 2011; Ibañez et al, 2018; Lorenzo-Calvo et al., 2021; Castro et al., 2022b).

Contextualizing the playing positions of team sports such as volleyball, basketball and football with the types of swimming in the context of swimming, the performance indicators can be more pronounced in athletes who are older, because they have the maturity, skill, cognitive and motor development necessary to efficiently execute such a playing position/swim, being highly decisive and effective during matches/trials, as the following studies show (Ibáñez et al., 2018). Lorenzo-Calvo et al. (2021) found that the swimming disciplines with the greatest influence of RAE are the butterfly, medley and breaststroke, which are considered complex swims, highlighting the medley which has several styles in its execution, including the butterfly and breaststroke in the same race. In basketball, the point guards, wings and pivots play a decisive role in scoring in the dynamics of the game (Ibáñez et al., 2018), and in volleyball, the point guards, opposites and centers are responsible for most of the scoring in a match, in contrast to those who do not have scoring characteristics, the libero and setters.

These playing positions cited in volleyball and basketball demonstrate the presence of RAE influencing the playing performance of team sports by older athletes (Castro et al., 2022b; Ibáñez et al., 2018). The RAE, when evidenced by performance indicators and correlated with specific positions in the game, serves as a warning to coaches regarding athlete selection processes, which cannot be influenced only by the acute performance indicators of a competition or game, as has been identified and warned in other team sports such as football (Hill & Sotiriadou, 2016; Finnegan et al., 2024). The RAE and its association with volleyball has so far been inconsistent, with a comprehensive literature in analyses with a large number of variables analyzed. However, there is a clear need for new studies that analyze RAE over time, as suggested by Wattie et al. (2008), to thruly asses the RAE impact in long-term sport, and in this case, in volleyball. Also, was observed the need for analyses in a wide range of sporting categories and levels in function of one variable, especially at younger ages, where the development process of athletes takes place in a dense way, allowing us to consolidate existing notions and trends about RAE in volleyball. It is important for coaches to keep an eye on their athletes' athletic development and talent selection processes, without being biased by biological or acute performance statistics, taking into account the athletes' biological individuality and previous experiences, in order to promote greater fairness in this development process.

Conclusion

From the findings of this review, it was possible to conclude that the subject of RAE in volleyball has not had a significant number of publications in the last 10 years (nine studies). However, there has been a significant increase in papers since 2018, revealing a new research trend in both Brazil and abroad in the investigation of the phenomenon in the sport in question, which may be related to the growing interest of authors in understanding the process of development and training of high-performance athletes. Most of the studies found were dedicated to investigating RAE in volleyball in the context of competitions at national level, analyzing the effect on males and females in the same study. The predominant age group surveyed was adults, followed by categories close to adults, such as U18 and juniors. With regard to the dependent variables, there was a plurality of categories, involving variables relating to the players and the team. Brazil, even with a low number of studies, stood out as the country that has conducted the most studies on the subject of RAE with volleyball players.

Specifically with regard to the male sex, the results of the articles investigated revealed an over-representation of players born in the first quartile, both in the playing positions and in the actions analyzed. For both sexes, an over-representation of those born in the first two quartiles was observed when compared to the athletes' academic time. For females, one study identified a higher representation of athletes born in the first and second quartile of the year and another with an over-representation of older athletes in the best-ranked teams in the competition. It can therefore be concluded that the phenomenon of RAE is found in different aspects that influence the development of the sport of volleyball, especially in males.

Limitations

This study has some limitations, initially the lack of standardization of the contexts analyzed, since the investigations were dedicated to different categories, age groups and secondary variables analyzed, as well as the inherent difficulty of searching for reviews using descriptors that represented the theme in all the databases chosen. As such, future studies on RAE in volleyball are suggested in order to better substantiate the analysis and inferences about the influence of the effect on the different covariates studied. It is also recommended that studies be carried out to analyze production on the subject in Brazilian postgraduate courses, given its prominence in publications and the presence of study groups dedicated to investigating the subject in question.

Financing

This study was funded by the Coordination for the Improvement of Higher Education Personnel (CAPES) - Code 0001 and by the Santa Catarina State University (UDESC).

References

Albaladejo-Saura, M., Vaquero-Cristóbal, R., García-Roca, J. A., & Esparza-Ros, F. (2022). The effect of age, biological maturation and birth quartile in the kinanthropometric and physical fitness differences between male and female adolescent volleyball players. Children, 9(1), 58. https://doi.org/10.3390/children9010058

Arrieta, H., Torres-Unda, J., Gil, S. M., Irazusta, J., & Rodriguez-Lorenzo, L. (2016). Relative age effect and performance in the U16, U18 and U20 European Basketball Championships. Journal of Sports Sciences, 34(16), 1530–1534. https://doi.org/10.1080/02640414.2015.1122204

Ato, M., López, J. J., & Benavente, A. (2013). Un sistema de clasificación de los diseños de investigación en psicología. Anales de Psicología, 29(3), 1038–1059. https://doi.org/10.6018/analesps.29.3.178511

Babic, M., Sisic, N., Sekulic, D., & Versic, S. (2022). Relative age effect and gender differentiation within sport: A systematic review. Acta Kinesiologia, 16(1), 20–29. https://doi.org/10.51371/issn.1840-2976.2022.16.1.3

Brustio, P. R., Kearney, P. E., Lupo, C., Ungureanu, A. N., Mulasso, A., Rainoldi, A., & Boccia, G. (2019). Relative Age Influences Performance of World-Class Track and Field Athletes Even in the Adulthood. Frontiers in Psychology, 10(1), 1-9. https://doi.org/10.3389/fpsyg.2019.01395

Campos, F. A. D., Stanganélli, L. C. R., Gabbett, T. J., da Costa, G. D. C. T., & Mariano, M. B. (2020). Relative age effect in the girls' volleyball U18 World Championship. Journal of Human Kinetics, 72(1), 195–202. https://doi.org/10.2478/hukin-2019-0106

Castellano, J., Silva, D. C., Andrade, C., Carnevale, D., Vasconcellos, F. (2024). Does birth month and position influence the use of both feet for playing football in u-17 category players? Retos, 59(1), 427-434. https://doi.org/10.47197/retos.v59.107349

Castro, H. O., Moreira, P. S., Werneck, F. Z., Coelho E Silva, M. J., & Lima, J. R. P. (2022a). The relative age effect in male and female Brazilian elite volleyball athletes of varied competitive levels. Perceptual and Motor Skills, 130(1), 485–496. https://doi.org/10.1177/00315125221134316

Castro, H. O., Moreira, P. S., Werneck, F. Z., Coelho E Silva, M. J., & Lima, J. R. P. (2022b). Prevalence of the relative age effect in elite Brazilian volleyball: An analysis based on gender, the playing position, and performance indicators. Journal of Human Kinetics, 84(1), 148–157. https://doi.org/10.2478/hukin-2022-0093

Cobley, S., Baker, J., Wattie, N., & McKenna, J. (2009). Annual age-grouping and athlete development: A meta-analytical review of relative age effects in sport. Sports Medicine, 39(3), 235–256. https://doi.org/10.2165/00007256-200939030-00005

Cular, D., Babic, M., Katovic, D., Beslija, T., & Kezic, A. (2024). How to Compare Relative Age Effect in Different Sports? A New Methodological Approach—Example of Youth Olympic Games. Sports, 12(8), 215. https://doi.org/10.3390/sports12080215

Elm, E. V., Altman, D. G., Egger, M., Pocock, S. J., Gøtzsche, P. C., & Vandenbroucke, J. P. (2007). The strengthening the reporting of observational studies in epidemiology (STROBE) statement: Guidelines for reporting observational studies. Journal of Clinical Epidemiology, 61(4), 344–349. https://doi.org/10.1016/j.jclinepi.2007.11.008

Goodway, J., Ozmun, J. C., & Gallahue, D. L. (2013). Motor development in young children. In O. N. Saracho & B. Spodek (Eds.), Handbook of research on the education of young children (pp. 103–155). Routledge.

Hancock, D. J., Adler, A. L., & Côté, J. (2013). A proposed theoretical model to explain relative age effects in sport. European Journal of Sport Science, 13(6), 630–637. https://doi.org/10.1080/17461391.2013.775352

Hancock, D. J., Ste-Marie, D. M., & Young, B. W. (2013). Coach selections and the relative age effect in male youth ice hockey. Research Quarterly for Exercise and Sport, 84(1), 126–130. https://doi.org/10.1080/02701367.2013.762325

Helsen, W. F., Van Winckel, J., & Williams, A. M. (2005). The relative age effect in youth football across Europe. Journal of Sports Sciences, 23(6), 629–636. https://doi.org/10.1080/02640410400021310

Ibáñez, S., García, L., Vázquez, A., & Rodríguez, F. (2018). The relative age effect in under-18 basketball: Effects on performance according to playing position. Plos One, 13(7), e0200408. https://doi.org/10.1371/journal.pone.0200408

Joyner, P. W., Lewis, J. S., Dawood, R. S., Mallon, W. J., Kirkendall, D. T., & Garrett, W. E. (2020). Relative Age Effect: Beyond the Youth Phenomenon. American Journal of Lifestyle Medicine, 14(4), 429–436. https://doi.org/10.1177/1559827617743423

Lago-Fuentes, C., Rey, E., Padrón-Cabo, A., Prieto-Troncoso, J., & García-Núñez, J. (2020). The relative age effect in professional futsal players. Journal of Human Kinetics, 72, 173–183. Disponível em: https://www.ncbi.nlm.nih.gov/pmc/articles/pmc7126250/

Lemoyne, J., Trudeau, F., & Grondin, S. (2023). The relative age effect in ice hockey: Analysis of its presence, its fading and of a reversal effect among junior and professional leagues. Journal of Human Kinetics, 87, 119–131. https://doi.org/10.5114/jhk/161573

Lorenzo-Calvo, J., Ortega, E., García, L., & Rodríguez, F. (2021). Prevalence and impact of the relative age effect on competition performance in swimming: A systematic review. International Journal of Environmental Research and Public Health, 18(20), 10561. https://doi.org/10.3390/ijerph182010561

Porto Maciel, L.F., Krapp do Nascimento, R., Milistetd, M., Vieira do Nascimento, J. & Folle, A. (2021) Systematic Review of Social Influences in Sport: Family, Coach and Teammate Support. Apunts Educación Física y Deportes, 145, 39-52. https://doi.org/10.5672/apunts.2014-0983.es

Malta, M., Morais, N. O., & Silva, G. A. (2010). Iniciativa STROBE: Subsídios para a comunicação de estudos observacionais. Revista de Saúde Pública, 44(3), 559–565. https://doi.org/10.1590/S0034-89102010000300021

Mendes, D., Silva, J., Lima, R., & Costa, G. (2022). Talent identification and development in male futsal: A systematic review. International Journal of Environmental Research and Public Health, 19(1), 10648. https://doi.org/10.3390/ijerph191710648

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. https://doi.org/10.1006/drev.2000.0516

Ntozis, C., Tsitskari, E., & Apostolopoulos, A. (2021). Relative age effect in Greek female young volleyball players: Data from the national talent identification program. Journal of Physical Education and Sport, 21(3), 1967–1975. https://doi.org/10.7752/jpes.2021.s3250

Ortega, J. A. F., Buitrago, J. A., & Rodríguez, D. A. S. (2021). Aspectos centrales de la identificación y desarrollo de talentos deportivos: Revisión sistemática. Retos, 39(1), 915–928. https://doi.org/10.47197/retos.v0i39.79323

Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., & Mulrow, C. D. (2021). PRISMA 2020 explanation and elaboration: Updated guidance and exemplars for reporting systematic reviews. British Medical Journal, 372, n160. https://doi.org/10.1136/bmj.n160

Parma, J. O., & Penna, E. M. (2018). The relative age effect on Brazilian elite volleyball. Journal of Physical Education, 29(1), e2942. https://doi.org/10.4025/jphyseduc.v29i1.2942

Pérez-González, B., Ramos, J., & García, S. (2021). The new generation of professional football talent is born under the bias of the RAE: Relative age effect in international male youth football championships. Children, 8(12), 1117. https://doi.org/10.3390/children8121117

Penna, E. M., & Moraes, L. C. A. (2010) The relative age effect in brazilian elite futsal players. Motriz Revista de Educação Física, 16(3), 658-663. http://dx.doi.org/10.5016/1980-6574.2010v16n3p658

Piloupas, D. A., & Telles, S. D. C. C. (2020). O efeito da idade relativa na natação: uma revisão sistemática. Revista Prisma, 1(1), 60-78.

Riaza, A., Pérez, A., & García, J. (2020). Impact of the relative age effect on competition performance in basketball: A qualitative systematic review. International Journal of Environmental Research and Public Health, 17(22), 8596. https://doi.org/10.3390/ijerph17228596

Romann, M., & Fuchslocher, J. (2011). Relative age effects in Swiss junior football and their relationship with playing position. European Journal of Sport Science, 13(4), 356–363. https://doi.org/10.1080/17461391.2011.635699

Rubia, A., Lorenzo-Calvo, J., & Lorenzo, A. (2020). Does the relative age effect influence short-term performance and sport career in team sports? A qualitative systematic review. Frontiers in Psychology, 11, 1947. https://doi.org/10.3389/fpsyg.2020.01947

Safranyos, S., Jaffé, L., & Tremblay, M. (2020). Academic timing and the relative age effect among male and female athletes in Canadian interuniversity volleyball. Perceptual and Motor Skills, 127(1), 182–201. https://doi.org/10.1177/0031512519881598

Sarmento, H., Anguera, M. T., Pereira, A., & Sampaio, J. (2018). Talent identification and development in male football: A systematic review. Sports Medicine, 48(1), 907–931. https://doi.org/10.1007/s40279-017-0851-7

Silva, L. A., Lopes, A. D., & Nascimento, D. P. (2022). The relative age effect in invasion team sports: A systematic review in youth sports. Retos, 46(1), 641–652. https://doi.org/10.47197/retos.v46.94211

Sliwa, M., Sadowski, J., & Buszta, M. (2021). Relative age effect and talent identification in youth volleyball players from the Polish volleyball federation sports school. Polish Journal of Sport Tourism, 28(4), 21–25. https://doi.org/10.2478/pjst-2021-0022

Smith, K. L., Weir, P. L., & Forth, R. (2018). Relative age effects across and within female sport contexts: A systematic review and meta-analysis. Sports Medicine, 48(1), 1451–1478. https://doi.org/10.1007/s40279-018-0890-8

Solon, L. J. F., & Silva, L. V. (2020). Influence of the relative age effect on height, motor performance and technical elements of Olympic volleyball athletes. Revista Brasileira de Medicina do Esporte, 26(3), 211–214. https://doi.org/10.1590/1517-869220202603200625

Tascioglu, R., Atalag, O., Yuksel, Y., Kocaeksi, S., Güven, G., Akyildiz, Z., & Nobari, H. (2023). Relative age effect and performance in elite youth male basketball. Scientific Reports, 13, 4544. https://doi.org/10.1038/s41598-023-31785-4

Varmus, M., Smith, J. D., & Johnson, A. B. (2022). Application of the perceived popularity of sports to support the sustainable management of sports organizations. Sustainability, 14(3), 1927. https://doi.org/10.3390/su14031927

Vegara-Ferri, J. M., García, L. P., & Pérez, R. S. (2019). Effect of relative age in the basketball world championships sub-17, sub-19 and Olympic games of Brazil 2016. Journal of Sport and Health Research, 11(1), 33–42. https://recyt.fecyt.es/index.php/JSHR/article/view/80846

Wattie, N., Cobley, S., & Baker, J. (2008). Towards a unified understanding of relative age effects. Journal of Sports Sciences, 26(13), 1403–1409. https://doi.org/10.1080/02640410802233034Mujica-Johnson, F. N., Concha López, R., Peralta Ferroni, M., & Burgos Henríquez, S. (2024). Perspectiva de género en la formación docente y escolar de Educación Física. Análisis crítico en función del contexto chileno (Gender perspective in Physical Education teacher training and schooling. Critical analysis based on the chilean context). *Retos*, *55*, 339–345. https://doi.org/10.47197/retos.v55.103535

Authors' and translators' details:

Leonardo Egerland Souto	leonardo.souto06@edu.udesc.br.	Autor/a
Mônica Cristina Flach	monica.flach7777@edu.udesc.br	Autor/a
Gabriel Costa de Souza	biiel2608@hotmail.com	Autor/a
Mariana Klauck Beirit	marianaklauck@outlook.com	Autor/a
Alexandra Folle	alexandra.folle@udesc.br	Autor/a
Sidney Bezerra	sidney_d_bezerra@yahoo.com	Traductor/a