



Relative age effect on Brazilian State Team volleyball championship

Efecto de la edad relativa en el Campeonato Brasileño de Voleibol de selecciones estatales

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Abstract

Introduction: The relative age effect in sports indicates that athletes born in the first quarters of the year have advantages in selection processes when compared to athletes born in others quarters. Although data on the effect of relative age in volleyball already exists, little is known about the youth categories in elite Brazilian volleyball.

Objective: To analyze the relative age effect on the selection of athletes participating in the Brazilian State Team Volleyball Championships, under-16 and under-18 teams, in the first and special divisions, in the year 2024.

Methodology: Data from 960 athletes extracted from the Brazilian Volleyball Confederation website were analyzed. The χ^2 test of independence was used to verify the association between the birth quarter and the variables sex, division, category, podium, and position. The Odds Ratio was calculated, and the effect size was determined from the Cramer's V value.

Results: Athletes were more likely to be relatively older in the male sex category, the under-16 category and the special division when compared with the female sex category, the under-18 category and the first division, respectively. There was no association between the quarter of birth and podium or position.

Discussion: The relative age effect may be related to the late maturation of male athletes, lower chronological age of younger age groups, and more developed sports practice environments.

Conclusions: Relative age is a present and relevant factor in the recruitment of young athletes in Brazilian volleyball.

Keywords

Athlete selection; talent identification; team sports; sport performance; youth category.

Resumen

Introducción: El efecto de la edad relativa en el deporte indica que los atletas nacidos en los primeros trimestres del año tienen ventajas en los procesos de selección en comparación con los otros. Si bien ya existen datos sobre el efecto de la edad relativa en el voleibol, se sabe poco sobre las categorías juveniles del voleibol brasileño de élite.

Objetivo: Analizar el efecto de la edad relativa en la selección de los atletas participantes en el Campeonato Nacional Brasileño de Voleibol sub-16 y sub-18, primera división y división especial, en el año 2024.

Metodología: Se analizaron datos de 960 atletas extraídos del sitio web de la Confederación Brasileña de Voleibol. Se utilizó la prueba χ^2 de independencia para verificar la asociación entre el trimestre de nacimiento y las variables género, división, categoría, podio y posición. Se calculó la razón de probabilidades y el tamaño del efecto se determinó a partir del valor V de Cramer.

Resultados: Existe una mayor probabilidad de que los atletas tengan una edad relativa más alta en la categoría masculina, sub-16 y división especial, en comparación con la categoría femenina, sub-18 y primera división, respectivamente. No se observó asociación entre el trimestre de nacimiento y el podio o la posición.

Discusión: El efecto de la edad relativa puede estar relacionado con la maduración tardía de los atletas masculinos, la menor edad cronológica de las categorías inferiores y los entornos de práctica deportiva más desarrollados.

Conclusiones: La edad relativa es un factor presente y relevante en el reclutamiento de atletas jóvenes en el voleibol brasileño.

Palabras clave

Categoría juvenil; rendimiento deportivo; deportes de equipo; identificación de talentos; selección de atletas.

Introduction

The process of training and selecting athletes in different sports is dynamic and long-term, with sporting success understood as a multifactorial phenomenon. These factors are distributed across different levels of the sports system, within which the macro level is the context and environment; the meso level is the sports development environment, which encompasses practice and training; and the micro level is the individual characteristics of the athlete (De Bosscher et al., 2006; Rees et al., 2016). Among the individual characteristics, aspects such as genetics, anthropometric and physiological factors, psychological skills, motivational orientations, and also the date of birth of the potential athlete stand out (Rees et al., 2016).

In volleyball, evidence reinforces the relevance of physical and anthropometric characteristics in the athlete selection process highlighting the attack reach, height of the athlete, and jump height (Rubajczyk & Rokita, 2020; Tsoukos et al., 2019). Jahandideh et al. (2021) investigated 240 athletes participating in an edition of the under-18 world championship and reported that the top four teams were taller, heavier, and had greater attack and block reach when compared to the teams ranked between 5th and 20th place.

In addition to these characteristics, there is an indication that talent selection prioritize athletes with a higher chronological age (Campos et al., 2020; Dell'antonio et al., 2025; Okazaki et al., 2011; Rubajczyk & Rokita, 2020; Sliwa et al., 2021; Sliwa et al., 2024). Referred to as the Relative Age Effect (RAE), this phenomenon concerns the influence of the difference in an individual's chronological age in relation to their peers within the same age category (Cobley et al., 2009) and has been investigated in various sports, including soccer (Mota et al., 2022), futsal (Dos Santos et al. 2025), handball (Krawczyk et al. 2023), basketball (Tascioglu et al., 2023), and volleyball (Campos et al., 2020; Dell'Antonio et al., 2025; Sliwa et al., 2024).

Investigations analyzing teams participating in world youth volleyball championships, of both sexes identified a significant prevalence of those born in the first quarters of the year (Campos et al., 2016; 2020; Dell'Antonio et al., 2025), indicating the presence of RAE in volleyball in elite international competitions in youth categories and suggesting that there is a competitive advantage for these individuals in relation to their younger peers. Campos et al. (2020) reported that approximately 36% of the athletes participating in the women's under-18 world championship were born in the first half of the last year eligible to participate in the competition, which is held every two years.

Specifically regarding athletes who are part of the Brazilian youth national teams in under-18, under-19, under-20, and under-21 world championships, Dell'Antonio et al. (2025) found that 46% were born in the first semester of the last eligible year, while only 10.4% were born in the last semester of the penultimate eligible year. Furthermore, in Brazil, there is evidence of a linear training path, in which more than 80% of athletes who are part of adult teams in world championships and Olympic games have competed in at least one youth world championship (Dell'Antonio et al., 2025). Since the formation of Brazilian youth national teams occurs, in part, through the selection of athletes from the Brazilian State Team Volleyball Championships (Campeonato Brasileiro de Seleções [CBS]), this sporting event presents itself as an important research scenario to broaden the understanding of the RAE in Brazilian volleyball.

Given the above, the objective of the current study was to analyze the RAE in the selection of athletes participating in the Brazilian State Team Volleyball Championships for under-16 and under-18 teams, in the first and special divisions, in the year 2024.

Methods

Procedure

The criteria for data selection were: participation in the Brazilian State Team Volleyball Championship in the special division or first division, in the under 16 or under 18 categories, for both female and male athletes, in 2024. The data were extracted from the Brazilian Volleyball Confederation (CBV) website (cbv.com.br), under the tab Quadra em CBS (Court in CBS), in the subheading Competições



(Competitions), where the categories, sexes, and divisions were selected. Within each subgroup, teams were selected to extract data for each athlete.

The data from 960 call-ups, 480 female athletes and 480 male athletes, were organized in a spreadsheet indicating sex (female or male), category (under 16 or under 18), division (special or first), position (setter, outside hitter, opposite, middle blocker, or libero), podium (yes - 1st, 2nd, or 3rd place, or no - 4th place and below) and date of birth. Based on the date of birth and age limit for the competition, the quarters of birth were classified as follows: Q1 born from January to March of the last eligible year; Q2 born from April to June of the last eligible year; Q3 born from July to September of the last eligible year; Q4 born from October to November of the last eligible year; Q5 born from January to March of the penultimate eligible year; Q6 born from April to June of the penultimate eligible year; Q7 born from July to September of the penultimate eligible year; Q8 born from October to December of the penultimate eligible year; and Q9 born in any later quarter.

Data analysis

To verify the association between the birth quarter and the other variables (sex, division, category, podium, and position), the χ^2 test of independence was used. The effect size (ES) of the χ^2 test of independence was determined from the Cramer's V value. A Cramer's V less than 0.058 was considered as trivial ES; between 0.058 and 0.172 as small ES; between 0.173 and 0.288 as medium ES; and greater than or equal to 0.289 as large ES (Mangiafico, 2025). The odds ratio (OR) and respective 95% confidence intervals were calculated for each association analyzed, comparing the odds of being born in Q1 compared to Q9 (Q1 vs. Q9) and the odds of being born in Q1 to Q4 compared to Q5 to Q9 (Q1-4 vs. Q5-9). The tests and calculations were performed using SPSS software, version 20.0, and Microsoft Office Excel software, version 2312, considering a p-value ≤ 0.05 to be statistically significant.

Results

The current study analyzed 960 Brazilian volleyball athletes of both sexes from the under-16 and under-18 categories who were called up for the CBS in 2024. The athletes belonged to 22 different federative units of Brazil.

The relative age of the athletes is shown in Figure 1, and the association between relative age and sex, division, category, podium, and position can be seen in Table 1. According to the results of the χ^2 test of independence, associations were found between the birth quarter and the sex ($\chi^2[8] = 43.986$; $p < 0.001$), category ($\chi^2[8] = 70.654$; $p < 0.001$) and division ($\chi^2[8] = 24.430$; $p = 0.002$), with effect sizes of medium, medium and small, respectively. The chances of athletes having a relatively older age were higher in the male category, special division and under-16 category when compared to the female category, first division and under-18 category, respectively. There was no association between the birth quarter and podium or position ($p > 0.05$).

Figure 1. Relative distribution of athletes' birth dates by quarter.

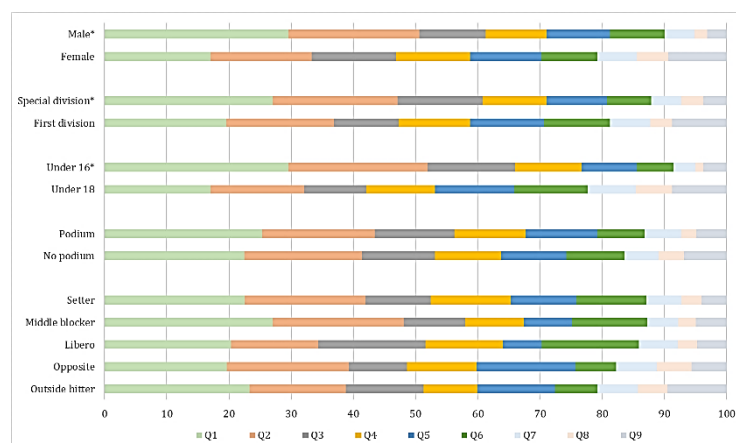


Table 1. Associations of relative age with sex, Division, category, podium and position.

	Total n	p-value*	Cramer's V	OR (CI95%) Q1 vs Q9	OR (CI95%) Q1-4 vs Q5-9
Sex	960				
Male	480	<0.001	0.214	5.20 (2.73-9.90) 1 (ref)	1.72 (1.32-2.25) 1 (ref)
Female	480				
Division	960				
Special	480	0.002	0.160	3.23 (1.75-5.95) 1 (ref)	1.72 (1.32-2.25) 1 (ref)
Fisrt	480				
Category	960				
Under 16	480	<0.001	0.271	4.04 (2.18-7.48) 1 (ref)	2.90 (2.20-3.83) 1 (ref)
Under 18	480				
Podium	960				
Yes	288	0.786	0.070	1.59 (0.82-3.07) 1 (ref)	1.20 (0.89-1.60) 1 (ref)
No	672				
Position^	708				
Setter	124	0.560	0.103	2.28 (0.78-6.67)	1.26 (0.80-1.98)
Middle blocker	181			2.22 (0.93-5.28)	1.38 (0.92-2.08)
Libero	64			1.77 (0.46-6.81)	1.19 (0.67-2.12)
Opposite	107			1.43 (0.51-4.01)	1.00 (0.62-1.59)
Outside hitter	232			1 (ref)	1 (ref)

Note: n: absolute frequency; *: χ^2 test of independence; OR: Odds ratio; CI95%: 95% confidence interval; ref: reference category; ^: 252 missing observations.

Discussion

After analyzing 960 call-ups of Brazilian volleyball athletes of both sexes from the under-16 and under-18 categories for the CBS in the special and first divisions, the main findings of the current study indicate that there is an influence of sex, category, and division on the RAE. However, there is no RAE when considering the position and the podium finishes in the competition.

In relation to sex, the results indicate that male athletes are 5.2 times more likely to have been born in the first quarter than in the ninth quarter when compared to female athletes. Furthermore, the comparisons of grouped quartiles revealed that male athletes are 72% more likely to have been born in trimesters 1 to 4 than in trimesters 5 to 9 when compared with female athletes, corroborating previous studies (Campos et al., 2025; Silva et al., 2018). Maturation differences between boys and girls play an important role in the manifestation of the RAE, with boys tending to reach full maturity later, while girls tend to develop earlier (Malina et al., 2015). Romann and Cobley (2015) point out that the RAE tends to be more evident in young girls, especially before puberty, and dissipates to some extent as maturation is completed, which may directly influence talent selection in each sex. Girls tend to reach physical maturity and peak pubertal growth around two years earlier than boys (Malina et al., 2004), which may explain why the RAE was less pronounced in females.

Although the magnitude of the RAE is generally lower among girls than boys (Delorme et al., 2010), the effect is still present and relevant, especially in sports where early physical development offers a competitive advantage. This effect has been observed in youth categories of women's volleyball (Campos et al., 2020; Dell'Antonio et al., 2025; Okazaki et al., 2011). However, it is important to consider that younger athletes within the same age range may eventually reach and even surpass older peers in terms of skills and development (McCarthy & Collins, 2014), agreeing with previous results that did not find RAE in elite adult athletes from various sports (Smith et al., 2018), in athletes participating in the main club volleyball competition in Brazil, the Superliga A (Castro et al., 2022; Parma & Penna, 2018) and in Olympic volleyball athletes (Solon & Silva, 2020).

In this sense, when comparing the under-16 and under-18 categories, it was found that an athlete in the under-16 category is four times more likely to be relatively older than an athlete in the under-18 category. Furthermore, in the analysis of grouped quartiles, it was found that an athlete in the under-16 category is 2.9 times more likely to have been born in quarters 1 to 4 than in quarters 5 to 9 when compared to an athlete in the under-18 category, corroborating the results of Campos et al. (2016). Campos et al. (2016), analyzing the men's world volleyball championships in the under-19, under-21, under-23 and senior categories, found that the RAE was observed more consistently in younger athletes and that as the athletes' age increased, the RAE gradually decreased.

Sliwa et al. (2024) found RAE in world volleyball championships for under-19, under-21 and senior men, reporting a reduction in the chances of an athlete being born in the last quarter of the year compared to the first quarter of the year across these categories (2.1 times, 1.7 times and 1.3 times for the under-19, under-21 and senior categories, respectively). In this context, along with the reduction in biological age differences, factors such as greater training experience begin to gain significance (Sliwa et al., 2024). It can be speculated that the increase in chronological age and process of biological maturation combined with the longer training time are able to level out physical, technical and psychological differences and reduce the initial advantages provided by the RAE (Krawczyk et al. 2023; Vegara-Ferri et al., 2019), which can be observed in the comparison between the under 18 and under 16 categories in the present study.

Despite this, some reports in the literature show that, although reduced when compared to younger categories, the RAE continues to exist in the adult category (Castro et al., 2022; Parma & Penna, 2018; Sliwa et al., 2024). Thus, further research is needed to consolidate knowledge about RAE behavior over time, considering different age categories and levels of volleyball practice.

When comparing the two divisions analyzed, it was found that an athlete competing in the special division is 3.2 times more likely to be relatively older than an athlete competing in the first division. The same relationship is found when comparing athletes born in quarters 1 to 4 with those born in quarters 5 to 9, where athletes in the special division are 72% more likely to be relatively older. These results corroborate previous studies (Cobley et al., 2009 e Delorme et al., 2010), including a pioneering study on the subject (Musch & Grondin., 2001), which, when relating differences in the RAE to the level of practice, reported that the higher the level of practice, the greater the presence of RAE.

Gerdin, Hedberg, and Hageskog (2018) found that at higher levels of competition, physical and maturational differences are more evident, suggesting that the RAE affects both the retention and success of athletes in their careers. The correlation between early maturation and greater success in team sports was also observed by Romann and Cobley (2015), who indicated that physical development can be a determining factor in the selection and progression of younger athletes. In sports like volleyball, anthropometric characteristics, such as height and reach, play a crucial role in differentiating high-performance teams (Jahandideh et al., 2021; Sliwa et al., 2021), which can influence the selection process favoring athletes who mature physically earlier.

An important factor to consider is that the divisions analyzed in the current study are formed by teams selected according to the state federation of origin of the athletes, that is, the athlete has no possibility of selecting a team, and the teams cannot select athletes from other states. These factors significantly affect the level of competitiveness, which is defined by the number of athletes likely to participate in a given sport (Musch & Grodin, 2001). In this context, the sports development environment is presented as a crucial factor in the talent selection process (Rees et al., 2016). In environments where there is greater institutional support and a better sports infrastructure, such as the states of São Paulo and Santa Catarina, participants in the special division, which has more than 50 clubs affiliated with its federations, there is a tendency for the RAE to manifest itself more intensely, since there are a greater number of athletes available for selection. In addition, more competitive environments can exacerbate the impact of the RAE, as there is greater pressure to achieve results from the youth categories onwards, favoring physically more mature athletes with greater practice experience. However, it seems relevant to investigate the RAE in athletes from different categories of teams/clubs participating in state championships, from which the athletes selected for the CBS originate, in order to broaden understanding of this phenomenon in Brazilian volleyball.

The analysis in current study revealed no association between the quarter of birth and podium achievement in the CBS. Although the authors did not compare these conditions with each other, Campos et al. (2020) found that there was RAE for medalists (podium), intermediate rankings, and lower rankings in the women's under-18 world championships. The same behavior was reported by Sliwa et al., (2024) when analyzing medal-winning athletes (podium), those ranked 4th to 8th, and other participants in the men's world volleyball championships in the youth and adult categories. This indicates that the RAE seems to be constant in youth volleyball categories and does not depend on the athlete's final ranking in the competition.



In the present study, no association was found between the quarter of birth and the athlete's position/role in the team. Although Ntozis et al. (2025) reported RAE in young volleyball players, when the comparisons were performed by position, the effect was mitigated. With adult athletes participating in the Brazilian Superliga A, there was also no difference between positions (Castro et al., 2022). These results suggest that the RAE in volleyball athletes is independent of the position performed on the court, possibly because the definition of an athlete's position depends on many factors, such as technical, tactical, physical, and psychological aspects. It is important to highlight that many of the athletes analyzed in the current study could be performing a position/role different from the one they are accustomed to when training and competing at their clubs, and also that many of these athletes may change positions in the future.

Among the main strengths of the current study, the sample of 960 call-ups from all regions of the country and the analysis of the RAE considering sex, division, category, final position in the competition, and playing position stand out. Potential limitations include incomplete information regarding the athlete position variable (more than 25% of the data were missing). Therefore, it is possible that different results would be found if there was an opportunity to analyze the complete data. Furthermore, since this study only analyzed one year of competition (2024), caution is advised when generalizing the results.

Conclusions

The results of the current study demonstrate that in the 2024 Brazilian State Team Volleyball Championships there was RAE when comparing sexes, categories, and divisions. Athletes in the male category, the special division, and the under-16 category were more likely to be relatively older than female athletes, athletes competing in the first division, and athletes in the under-18 category, respectively. However, the RAE in the final result (podium) and in the athlete's position during the analyzed competition seems to be mitigated by other factors.

Future studies should consider analyzing the type of participation of athletes (starting players, substitutes) as well as technical performance indices (individual and team) in order to more accurately recognize the consequences of the RAE in the selection of young volleyball athletes. Furthermore, studies analyzing the RAE in training clubs (which provide athletes for state teams) could help to broaden understanding of this phenomenon in Brazilian volleyball and guide the development of effective sports policies.

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