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El Efecto de la Edad Relativa basado en la posición de juego y el rendimiento en el baloncesto de élite masculino brasileño

The Relative Age Effect based on playing-position and performance on Brazilian elite men's basketball

O Efeito da Idade Relativa baseado na posição de jogo e desempenho no basquetebol masculino Brasileiro de elite

Henrique de Oliveira Castro[1], Vivian de Oliveira[2,3], Matheus de Souza Rocha[1], Walber Figueiredo de Souza[1], Lucas De Castro Ribeiro[4], Sérgio Adriano Gomes[5,6,7], Lucas Savassi Figueiredo[8]

[1]Universidade Federal de Mato Grosso - UFMT, Cuiabá, MT, Brazil; [2]Centro Universitário IESB, Brasília, DF, Brazil; [3]Universidade Estadual Paulista - UNESP, Rio Claro, SP, Brazil; [4]Universidade do Porto, Porto, Portugal; [5]Universidade Católica de Brasília – UCB, Taguatinga, DF, Brazil; [6]Centro Universitário UNICEUB, Brasília, DF, Brazil; [7]Secretaria de Estado de Educação do Distrito Federal - SEEDF, Brasília, DF, Brazil; [8]Universidade Federal de Juiz de Fora campus Avançado de Governador Valadares - UFJF-GV, Governador Valadares, MG, Brazil

RESUMEN

El objetivo de este estudio fue verificar la existencia del Efecto de Edad Relativa (RAE) en el baloncesto de élite masculino brasileño, considerando los cuartiles de nacimiento de los atletas, las posiciones de juego, la colocación del equipo y el rendimiento táctico-técnico en el Novo Basquete Brasil (NBB). Se analizaron un total de 454 atletas masculinos según sus cuartiles de nacimiento, posiciones de juego, colocación final del equipo en el campeonato y rendimiento táctico-técnico. Se utilizó la prueba de ajuste chi-cuadrado para comparar la distribución de los cuartiles de nacimiento para la muestra general y según las posiciones de juego y la colocación final del equipo. Se utilizó la prueba de Kruskal-Wallis para comparar el rendimiento táctico-técnico según los cuartiles de nacimiento. Los resultados indicaron que los atletas nacidos en el último cuartil del año fueron menos frecuentes que aquellos nacidos en el primer ($p < 0.001$), segundo ($p < 0.006$) y tercer ($p < 0.001$) cuartil del año para la muestra general. También se informaron distribuciones desiguales para la posición de Ala ($p = 0.018$). Con respecto a la colocación final del equipo, se observaron distribuciones desiguales para equipos intermedios en la temporada 2019/2020 ($p = 0.014$), equipos mejores colocados en la temporada 2020/2021 (0.027) y equipos peores colocadas en la temporada 2021/2022 ($p = 0.005$). No se encontró asociación entre el RAE y ninguna variable de rendimiento táctico-técnico ($p > 0.005$). Se concluye que el RAE estuvo presente en el NBB en atletas masculinos de élite brasileños, pero no parece ser un factor asociado con el rendimiento táctico-técnico colectivo ni individual.

Palabras clave: Efecto de la Edad Relativa; Rendimiento Táctico-Técnico; Desarrollo del Atleta; Baloncesto; Cuartil de Nacimiento.

Correspondencia: **Henrique de Oliveira Castro.** Physical Education Department, Physical Education Faculty, Universidade Federal de Mato Grosso – FEF/UFMT. Av. Fernando Corrêa da Costa, 2367. Boa Esperança, Cuiabá, Mato Grosso, Brazil. Zip code: 78060-900. Phone: +55 61 99868-5563. Email: henriquecastro88@yahoo.com.br

ABSTRACT

The aim of this study was to verify the existence of RAE in Brazilian elite male basketball, considering athletes' birth quartiles, playing positions, team placement, and tactical-technical performance in the *Novo Basquete Brasil* (NBB). A total of 454 male athletes were analyzed according to their birth quartiles, playing positions, final team placement in the championship, and tactical-technical performance. The goodness of fit chi-square test was used to compare the distribution of birth quartiles for the overall sample and based on playing positions and team final placements. The Kruskal-Wallis test was used to compare tactical-technical performance based on birth quartiles. Results indicated that athletes born in the last quartile of the year were less frequent than those born in the first ($p < 0.001$), second ($p < 0.006$), and third ($p < 0.001$) quartiles of the year for the overall sample. Unequal distributions were also reported for the Small Forward position ($p = 0.018$). Regarding the final team placements, unequal distributions were observed for intermediate teams in the 2019/2020 season ($p = 0.014$), top teams in the 2020/2021 season (0.027), and bottom teams in the 2021/2022 season ($p = 0.005$). No association was found between RAE and any tactical-technical performance variable ($p > 0.005$). It is concluded that RAE was present in the NBB in Brazilian elite male athletes, but it does not seem to be a factor associated with collective nor individual tactical-technical performance.

Keywords: Relative Age Effect; Tactical-Technical Performance; Athlete Developement; Basketball; Birth quartile.

RESUMO

O objetivo deste estuo foi verificar a existência do Efeito da Idade Relativa (EIR) no basquetebol masculino de elite Brasileiro, considerando os quartis de nascimento, posições de jogo, colocação da equipe e desempenho tático-técnico de atletas do Novo Basquete Brasil (NBB). Foram analisados 454 atletas masculinos de acordo com seus quartis de nascimento, posições de jogo, colocação final da equipe no campeonato e desempenho tático-técnico. O teste qui-quadrado de ajuste foi utilizado para comparar a distribuição dos quartis de nascimento da amostra geral e de acordo com as posições de jogo e colocação final da equipe. O teste Kruskal-Wallis foi utilizado para comparar o rendimento tático-técnico de acordo com os quartis de nascimento. Os resultados indicaram que os atletas nascidos no último quartil do ano foram menos frequentes do que os nascidos no primeiro ($p < 0.001$), segundo ($p < 0.006$) e terceiro ($p < 0.001$) quartis do ano para a amostra geral. Também foram apresentadas distribuições desiguais para a posição ala ($p = 0.018$). Em relação a colocação final da equipe, observou-se distribuições desiguais para as equipes intermediárias na temporada 2019/2020 ($p = 0.014$), equipes melhores colocadas na temporada 2020/2021 (0.027) e equipes piores colocadas na temporada 2021/2022 ($p = 0.005$). Não foram encontradas associações entre o EIR e nenhuma variável de desempenho tático-técnico ($p > 0.005$). Conclui-se que o EIR está presente no NBB em atletas masculinos de elite Brasileiros, mas não parece ser um fator asociado com o desempenho tático-técnico coletivo e individual.

Palavras chave: Efeito da Idade Relativa; Desempenho tático-técnico; Desenvolvimento de atletas; Basquetebol; Quartis de nascimento.

INTRODUCTION

In several team sports, the date of birth is crucial for the division and organization of competitive categories. The difference in birth dates of athletes grouped within an annual cohort leads to a prevalence of older athletes (born in the early months of the year) over younger athletes (born in the later months of the year). This phenomenon is known as the Relative Age Effect (RAE) (Cobley et al., 2009). Possible advantages for older individuals compared to younger ones (Navarro-Patón et al., 2021) are reported to arise from maturational, cognitive, and physiological perspectives (Cobley et al., 2009).

Relative Age Effect on Brazilian Elite Men's Basketball

From a maturational perspective, studies suggest that, especially in early categories, individuals within the same category present significant differences in anthropometric factors, resulting in physical advantages, better performance and competition opportunities for older athletes compared to their younger peers (Pino-Ortega et al., 2022). Similarly, cognitive aspects are crucial in improving motor skills, as well as in muscular and physiological development, which are also influenced by the RAE (Navarro-Patón et al., 2021). From the perspective of athlete selection, the early selections are considered crucial for their development and progression in the sport, including at school age (Figueiredo et al., 2023; Castro et al., 2023), as they provide access to better training conditions, better coaches, and higher-level competitions (Caregnato et al., 2023; Clemente et al., 2021; Krahenbühl & Leonardo, 2020; Müller et al., 2018). Additionally, studies suggest that these advantages may perpetuate even at the highest competitive levels in some sport contexts (Cobley et al., 2009).

Wattie et al. (2015) proposed the Constraints-Based Theory as a possible explanation for the RAE, based on the interaction between the individual, the environment, and the task constraints. The individual constraints refer to the individual qualities of the athlete, such as gender, height, weight, body composition, and maturation level, among others. Environmental constraints are related to the popularity of the sport, public policies, and available physical facilities, for example. Finally, task constraints relate to the particularities of sports, competition level, and the athlete's physical factors (Castro et al., 2022b; Wattie et al., 2015). Therefore, the interaction between these aspects is complex and context-specific for many sports, which highlights the relevance of RAE investigations across different contexts (Figueiredo et al., 2021).

Several studies present the RAE in elite athletes of invasion team sports such as futsal (Castro et al., 2022c), handball (Costa et al., 2021), soccer (Figueiredo et al., 2022), rugby (Kelly et al., 2021), cricket (Connor et al., 2019), and basketball (Maciel et al., 2021). Specifically in basketball, studies found the RAE in youth (Vegara-Ferri et al., 2019) but not in senior categories. In the U18 category, Ibañez et al. (2018) analyzed the RAE regarding the position of play and performance indicators in the main European youth tournament. They found the presence of RAE in the point guard position. Arrieta et al. (2016) analyzed the RAE and performance in the U16, U18, and U20 categories, and noted the RAE in all age groups in male players, as well as more playing time and better performance for older players. Esteva et al. (2006) verified the RAE in several divisions of the Spanish adult male league and the National Basketball Association (NBA), and the results pointed to the predominance of RAE in the first division of the Spanish league. Werneck et al. (2016) evaluated the presence of RAE in the 2012 London Olympics and observed RAE only in the French team. Other studies point to the RAE in German adult basketball (Schorer et al., 2011), but Steingröver et al. (2016) failed to find similar results in the NBA.

In Brazil, Oliveira et al. (2019) investigated three Brazilian leagues (*Novo Basquete Brasil* – NBB, *Liga de Desenvolvimento do Basquete* – LDB, and *Liga de Basquete Feminino* - LBF). They reported that RAE was found in teams from the Southeast region of NBB and the South and Southeast regions of LDB, but they did not observe a relationship with the final ranking of the teams in the competitions. Ribeiro Junior et al. (2021) pointed out that RAE is present in lower categories, but it does not establish a connection regarding the advancement of athletes to NBB. However, it is observed that most studies in Brazilian basketball were conducted with lower categories such as U-13, U-15, U-17, and U-19 (Kós et al., 2019; Maciel et al., 2022; Oliveira et al., 2017).

The RAE is a phenomenon influenced by the competitive level, popularity of the sport, and athlete selection process (Maciel et al., 2022; Steingröver et al., 2016; Wattie et al., 2015). In addition, in national contexts, athlete selection is mediated by sport-cultural, geographical, and social factors (Côté et al., 2016; de la Rubia et al., 2020). Therefore, it is important to investigate the RAE in Brazilian elite basketball at the highest competitive levels, considering more than one competitive season, in order to understand if this phenomenon prevails in the medium/long term. Consequently, the objective of this study was to verify the existence of the RAE in Brazilian elite male basketball players, considering the birth quartiles (Q1 to Q4 quarters), final team placement, playing positions, and player's tactical-technical performance in four variables in three consecutive seasons (2019-2020, 2020-2021, and 2021-2022) of the *Novo Basquete Brasil* (NBB). Based on previous research conducted in Brazil, including in the NBB, we expect to observe the RAE in this sample, but not in the final team placement, playing positions, or players' tactical-technical performance.

METHODS

Study design

This study employed a descriptive, cross-sectional, and observational approach design (Anguera & Hernández-Mendo, 2016; Ato et al., 2013) to verify the existence of RAE in Brazilian elite male basketball, similar to other empirical studies that have investigated the RAE on sports (Solon-Junior et al., 2024; Isorna-Folgar et al., 2023; Leonardi et al., 2022).

Participants

We collected data from 454 male elite basketball athletes who participated in the 2019/2020, 2020/2021, and/or 2021/2022 seasons of the *Novo Basquete Brasil* (NBB) championships. A total of 48 teams participated in the seasons analyzed (16 in 2019/2020; 15 in 2020/2021; 17 in 2021/2022). Similar to previous studies that investigated RAE (Solon-Junior et al., 2024; Castro et al., 2022a) and by following the National Council of Ethics guidelines in Research of Brazil (resolution 510/16), the present study did not need ethical approval because the data were collected on an open website.

Procedures

Players' full names, date of birth, playing positions, teams placement, and tactical-technical performance were obtained from rosters available at the Brazilian Basketball Confederation (CBB) Official Website (www.cbb.com.br). Data collection was performed in July 2022. Athletes whose information was incomplete were not considered for the study (One athlete was excluded for not meeting this criterion). These archived data are open-access, and no ethical issues were involved in the analysis and interpretation as they were obtained in secondary form and not generated by experimentation. All data used in this study were reported anonymously.

The variables analyzed included the athletes birth quarters: Q1 (January-March), Q2 (April-June), Q3 (July-September), and Q4 (October-December), the final placement of the teams in the seasons analyzed (top-4, intermediate, and bottom-4), playing positions (point guards, shooting guards, small forwards, power forwards, and centers), and the players' tactical-technical performance in four variables (score, rebounds, assists, and efficiency).

The score is considered as the points awarded when the player successfully shoots the basketball through the hoop. The rebound is considered the action to retrieve the ball after a missed field goal or free throw. The assist is a pass that directly results in a teammate scoring. The efficiency index is a number that portrays the real contribution of an athlete to his team in the match, since both positive and negative attributes are considered. We calculated it as follows: (points + rebounds + blocks + steals + assists) - (missed two points shots + missed three points shots + missed free throws + turnovers). Tactical-technical performance values were calculated for all players who participated in at least one game across the three seasons analyzed. These values were calculated as the mean value for each variable, considering the number of games played in each season.

Statistical analysis

The frequencies of athlete' birth quarters were presented in relative and absolute values. We analyzed the occurrence of the RAE among players by comparing the frequency of athletes born in each quarter and the expected frequency, based on Edgar and O'Donoghue (2005).

Chi-square goodness-of-fit tests (χ^2) were performed to compare the athletes birth quarters distribution for the overall sample and based on playing positions and final placement of the teams over seasons. For the playing position analyses, athletes were only considered once, in the playing position they performed in the most recent season. In the final placement analyses, athletes who played more than one season were analyzed in all seasons, since the team placement could have varied across seasons. The effect size (w) of the chi-square tests was calculated for all analyses. As a reference, 0.1 was considered a small effect, 0.3 a medium effect, and 0.5 a large effect, based on Cohen (1992). Additionally, odds ratios (ORs) and 95% confidence intervals were calculated for both quarter and semester distribution for each of the variables analyzed. The significance level was set to 0.05,

except when post hoc multiple comparisons between quarters were necessary, in which Bonferroni's corrections were performed. In these cases, the significance level was adjusted to 0.0083.

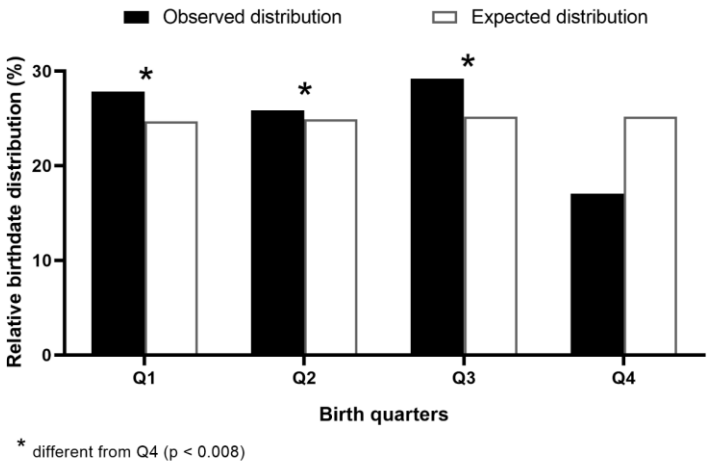
For the tactical-technical performance analyses, the Kolmogorov-Smirnov test indicated that data did not present a normal distribution ($p < 0.01$). Therefore, the tactical-technical performance of players (score, rebounds, assists, and efficiency) was compared based on their birth quarters using the Kruskal-Wallis test. For the performance analyses, athletes who did not play any games were excluded (32 athletes), and the mean of the performance of athletes who competed in more than one season was considered (180 athletes). The effect size (η^2) of the Kruskal-Wallis tests was calculated for all analyses based on Cohen (1992), in which 0.01 was considered a small effect, 0.06 a moderate effect, and 0.14 a large effect. The level of significance was set to 0.05. All analyses were performed in the Statistical Package for the Social Sciences (SPSS), version 20.0 (Chicago, USA).

RESULTS

Figure 1 depicts the observed and expected frequencies of birth quarters considering all athletes from the 3 seasons analyzed. Analyses indicated the prevalence of RAE in the overall sample ($\chi^2 = 16.829$; $p < 0.001$; $w = 0.163$; OR - Q1:Q4 = 1.88; OR - 1^{st}:2^{nd} = 1.35). Additionally, post hoc analyses indicated that athletes born in the last quarter of the year were less frequent than athletes born in the first ($p < 0.001$), second ($p < 0.006$), and third ($p < 0.001$) quarters of the year.

Figure 1

Relative expected and observed birthdate frequencies for the overall sample.



The playing position analyses revealed even distributions of birth quarters for point guards, shooting guards, power forwards and centers ($p > 0.05$), as seen in Table 1. On the other hand, uneven distributions were reported for small forwards ($p = 0.018$), but post hoc analyses failed to locate the differences ($p > 0.008$).

Table 1

Birth quarter distributions based on playing positions.

Playing position	Q1 (Exp)	Q2 (Exp)	Q3 (Exp)	Q4 (Exp)	χ^2	p	w	OR - Q1:Q4 95% IC	OR - 1st:2nd 95% IC
Point guard	32 (24)	29 (24.2)	20 (24.4)	16 (24.4)	7.376	0.061	0.226	2.49 1.26 to 4.91	2.87 1.6 to 5.14
Shooting guard	17 (13.8)	13 (13.9)	16 (14.1)	10 (14.1)	2.237	0.525	0.176	2 0.83 to 4.83	1.33 0.63 to 2.8
Small forward	40 (31.4)	28 (31.6)	40 (32)	19 (32)	10.065	0.018	0.262	2.61 1.42 to 4.81	0.97 0.59 to 1.59
Power forward	18 (18.8)	21 (18.9)	24 (19.1)	13 (19.1)	3.462	0.326	0.193	1.5 0.68 to 3.31	1.11 0.59 to 2.1
Center	19 (23.7)	26 (23.9)	32 (24.2)	19 (24.2)	4.76	0.19	0.222	1 0.49 to 2.02	0.78 0.44 to 1.17

Note. Q1-Q4, birth quarter; (Exp), expected distribution; χ^2, chi square; p, level of significance; w, effect size; OR - Q1:Q4, odds ratio from Q1 to Q4; OR - 1st:2nd odds ratio from 1st semester to 2nd semester.

The results of birth quarter distribution analyses based on final placement for seasons 2019/2020, 2020/2021, and 2021/2022 are shown in Table 2. We found uneven distributions for Intermediate teams in the 2019/2020 season. The post hoc analyses indicated that athletes born in the second ($p = 0.004$) and third ($p = 0.007$) quarters were more frequent than athletes born in the last quarter of the year.

In the 2020/2021 season, an uneven distribution was reported for the bottom-4 and top-4 teams. The post hoc analyses failed to locate these differences ($p > 0.008$) for the bottom-4 teams. On the other hand, post hoc analyses for the top-4 teams indicated that athletes born in the second quarter were more frequent than athletes born in the last quarter of the year ($p = 0.008$). Similarly, an uneven distribution was reported for the bottom-4 teams in the 2021/2022 season, but the post hoc analyses failed to locate these differences ($p > 0.008$).

Table 2

Birth quarter distributions across seasons based on teams' final classification.

Season	Classif.	Q1 (Exp)	Q2 (Exp)	Q3 (Exp)	Q4 (Exp)	χ^2	p	w	OR - Q1:Q4 95% IC	OR - 1st:2nd 95% IC
19/20	Top-4	18 (14.3)	12 (14.4)	14 (14.6)	14 (14.6)	1.405	0.704	0.156	1.41 0.63 to 3.19	1.15 0.55 to 2.38
	Interm.	31 (27.2)	34[d] (27.4)	32[d] (27.7)	13 (27.7)	10.598	0.014	0.271	2.93 1.45 to 5.92	2.09 1.22 to 3.57
	Bottom-4	21 (22.7)	18 (22.9)	29 (23.2)	24 (23.2)	2.681	0.444	0.21	0.84 0.43 to 1.64	0.54 0.3 to 0.97
20/21	Top-4	20 (16.3)	24[d] (16.4)	14 (16.6)	8 (16.6)	9.201	0.027	0.321	3.15 1.29 to 7.67	4 1.94 to 8.24
	Interm.	34 (28.4)	34 (28.6)	26 (29)	21 (29)	4.594	0.204	0.147	1.87 1.01 to 3.48	2.09 1.24 to 3.54
	Bottom-4	20 (14.8)	13 (14.9)	20 (15.1)	7 (15.1)	7.995	0.46	0.346	3.79 1.48 to 9.63	1.49 0.73 to 3.06
21/22	Top-4	18 (15.3)	16 (15.4)	20 (15.6)	8 (15.6)	5.434	0.143	0.271	2.76 1.11 to 4.78	1.47 0.73 to 2.99
	Interm.	40 (30.1)	32 (30.4)	29 (30.7)	21 (30.7)	6.486	0.09	0.188	2.35 1.29 to 4.27	2.07 1.25 to 3.45
	Bottom-4	10 (13.3)	10 (13.5)	25 (13.6)	9 (13.6)	12.830	0.005	0.502	1.14 0.43 to 2.66	0.35 0.16 to 0.87

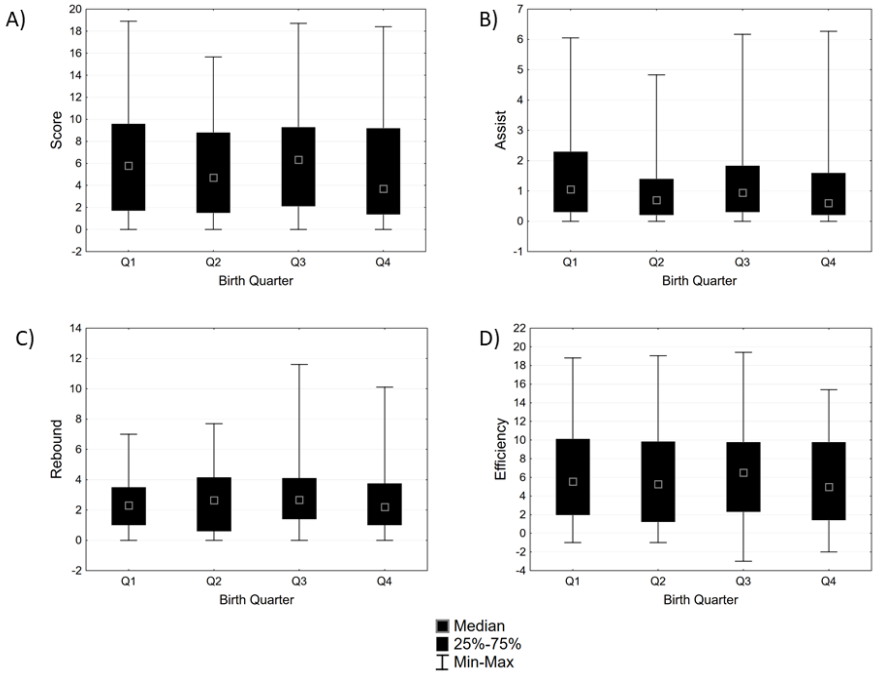
Note. Classif., final classification, Q1-Q4, birth quarter; (Exp), expected distribution; χ^2, chi square; p, level of significance; w, effect size; OR - Q1:Q4, odds ratio from Q1 to Q4; OR - 1st:2nd odds ratio from 1st semester to 2nd semester; Top-4, 4 best classified teams; Interm., intermediate teams; Bottom-4, 4 worst classified teams; Interm., d, different from Q4.

Tactical-technical performance analyses

No association between RAE and any of the tactical-technical performance variables was reported, as we can see in Figure 2. Analyses indicated that performance did not differ based on the athletes' quarters of birth for score ($H(3) = 2.503$; $p = 0.47$; $\eta^2 = -0.001$), assist ($H(3) = 6.341$; $p = 0.1$; $\eta^2 = 0.008$), rebound ($H(3) = 2.338$; $p = 0.51$; $\eta^2 = -0.001$), and efficiency ($H(3) = 1.472$; $p = 0.69$; $\eta^2 = -0.002$).

Figure 2

Boxplots for athlete's tactical-technical performance on A) Score, B) Assist, C) Rebound, and D) Efficiency based on their quarter of birth.



DISCUSSION

The present study investigated the existence of RAE in elite Brazilian male basketball players, considering birth quartiles (Q1 to Q4 quarters), teams' final placement (top-4, intermediate, and bottom-4), playing positions (point guards, shooting guards, small forwards, power forwards, and centers), and tactical-technical performance in four variables (score, rebounds, assists, and efficiency) in the 2019-2020, 2020-2021, and 2021-2022 NBB seasons. Overall, the results indicated that Q4-born athletes were less frequent than those born in the first three quarters. Unequal distribution was found for the small forward positions. Differences were found in the final placements of teams in the 2019/2020 intermediate positions, 2020/2021 top positions, and 2021/2022 bottom positions. RAE was not associated with any tactical-technical performance variables. These results partially confirm our hypotheses.

In the overall analysis, a prevalence of RAE was observed, with a higher frequency of athletes born in Q1, Q2, and Q3 compared to Q4, confirming our first hypothesis. In this context, the division into categories based on the year of birth favors athletes born in the first months of the year over their younger peers, and this phenomenon may extend to high performance (Cobley et al., 2009). Our results are similar to those of other studies conducted in Brazilian youth categories and in adults (Oliveira et al., 2019; Ribeiro Junior et al., 2021). On the other hand, these findings seem to be context-specific, since Vegara-Ferri et al. (2019) did not find the RAE in players in the 2016 Olympic Games. Werneck et al. (2016) also investigated the RAE in the Olympic Games but only observed this effect in the French team, considering the 2012 Olympic Games. According to de la Rubia et al. (2020), in national

contexts, the focus of athlete selection may be on the result, not the process. This would contribute to a rapid specialization in the sport, as well as to a high volume of deliberate practice and consequently to improving short-term performance. Moreover, considering that athlete selection in national contexts is mediated by sport-cultural, geographic, and social factors (Côté et al., 2016), our results make sense in the Brazilian context, characterized culturally by pressure from sports managers, the press, and fans for immediate results, which may contribute to the selection of relatively older athletes. In addition, as the largest Brazilian league, competition for spots on teams is the highest in the country, which also increases the likelihood of RAE (Steingröver et al., 2016; Wattie et al., 2015).

The analyses of playing position revealed uneven distributions for small forwards with a small effect size and a higher likelihood of being born in Q1 compared to Q4 (OR - Q1:Q4 = 2.61), which contradicts our hypothesis. However, post hoc analysis did not identify where these differences were, which makes it difficult to draw deep conclusions about this result. Similarly, Ibañez et al. (2018) noticed that the point guard position had a higher chance of being born in the first half of the year. Arrieta et al. (2016) verified the male and female European U16, U18, and U20 championships in the 2013 season, and the findings indicated a higher representation of players born in Q1 and Q2 in all positions. Moreover, the small forward position had the highest frequency of athletes born in the first semester. In this study, we found differences only for the small forward position. We speculate that this result may be related to the possible reduction of the RAE found in adult categories, as the advantages related to maturational aspects may disappear (Ibañez et al., 2018). At this stage, the maturational differences decrease, and relatively young players who surpass these differences may present similar or even superior performances compared to their peers (Malina et al., 2015). This reinforces the notion that RAE may not be an adequate predictor of long-term performance.

In the analyses based on final placement for seasons 2019/2020, 2020/2021, and 2021/2022 (Table 2), we found associations between RAE and the final placement for Intermediate (Q2 and Q3 were more frequent than Q4) teams in the 2019/2020 season, and top-4 (Q2 more frequent than Q4) teams in the 2020/2021 season, which contradicts our hypothesis. Uneven distributions were also found for the bottom-4 teams in the 2020/2021 and 2021/2022 seasons, however, the post hoc analyses failed to locate these differences. Tascioglu et al. (2023) found associations between better final rankings of U16 teams and a higher presence of athletes born in the first months of the year. On the other hand, Rubajczyk et al. (2017) observed the RAE in all ranges of basketball team rankings in Poland between 14 and 22 years old. Oliveira et al. (2019) also did not observe an association between the final ranking of teams in Brazilian competitions. In this research, the analyzed competitions were part of the Brazilian professional league, which may help explain the difference in relation to the study by Tascioglu et al. (2023), which was conducted with adolescents. Similarly, de la Rubia et al. (2020) also reported a greater impact of RAE in categories up to 18 years old compared to the senior category. The findings of this research need future data to draw deeper conclusions because in one season the RAE was present in teams with intermediate ranking and in the following season it was observed in the top four teams. Furthermore, the post hoc did not locate the differences for the bottom-4 teams in 2020/2021, but in these teams, we found a higher probability of their athletes being born in Q1 compared to Q4 (OR - Q1:Q4 = 3.79). Although we found the RAE in the overall analysis, RAE does not appear to be associated with collective performance, nor determine the final ranking of teams in the seasons analyzed.

In the analysis of tactical-technical performance, we found no association between RAE and the analyzed variables, confirming our hypothesis. Arrieta et al. (2016) observed better individual performance for relatively older athletes in the European Basketball Championship from U16 to U20. As stated by de la Rubia et al. (2020) RAE is expected to present a greater impact in categories up to 18 years, which may explain our results. As with the final team placement, RAE did not appear to be a good predictor of individual performance since it was not associated with tactical-technical performance in the sample of this study. Anthropometric factors can contribute to achieving better performances and influence athlete selection (Ibañez et al., 2015). However, in adults, after the maturation period, these differences tend to disappear (Arrieta et al., 2016), which may have contributed to not finding RAE in the tactical-technical performance indicators.

This study has limitations, such as analyzing data from a short period of time (3 seasons) and using the same tactical-technical variables to evaluate players from all playing positions. In this line, it is suggested that future studies base their analysis on longer time periods in addition to employing other analysis criteria, such as playing time in games, as well as weighting specific tactical-technical criteria considering the most common/expected actions for each playing position. Additionally, future studies are warranted to analyze RAE in elite women's basketball, which may broaden the understanding of this phenomenon across women's sports.

CONCLUSION

The results of this research indicated the presence of RAE in the NBB in all analyzed seasons. When playing positions were considered, this effect was reported only for small forwards. Regarding team final ranking and tactical-technical performance, no association with RAE was found. Therefore, even though the RAE phenomenon is present in this context, it does not appear to be a factor associated with collective performance or individual tactical-technical performance in Brazilian professional basketball.

PRACTICAL APPLICATIONS

Our study contributes to practice by highlighting the possible small relationship between RAE and collective and individual performance in Brazilian professional basketball. This reinforces the need, recurrently reported in the literature, to review athlete selection policies. In Brazil, the pursuit and pressure for immediate results, both in youth categories and at the professional level, can impact the selection of young athletes and the maintenance of athletes who are perceived as more talented by coaches but in fact, they are only older than their peers. Literature suggests some measures to mitigate the RAE in sports wich can be considered in the basketball. Coaches should know this phenomenon and our consequences. The results highlight the need to carefully the role and need for competitive opportunities at different age-groups in basketball. Thus, it is necessary to raise awareness among managers and coaches about this phenomenon, in order to provide similar developing opportunities for relatively younger players.

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