

Inequality in Brazilian basketball: the birthplace effect

Desigualdade no basquete brasileiro: efeito do local de nascimento

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Abstract – This study aimed to investigate the birthplace effect in Brazilian basketball athletes of both sexes according to their states and geographical regions. Our hypothesis is that the São Paulo (SP) state is the leading player in the Southeastern region and stands out from the other regions. The birthplace of Brazilian athletes participating in the FIBA World Cup and in two national leagues were collected from open-access websites. Three hundred and fifteen athletes' birthplaces were included. The absolute and relative frequencies of athletes' birthplaces per state and geographical region were calculated. Chi-Square tests were used to compare the expected and the observed frequencies of birthplaces among regions and states. Odds Ratios and 95% confidence intervals were calculated to indicate the probability of a high-level athlete to be born in a certain region or state. The results completely confirmed our hypothesis, showing higher frequencies of athletes born in the Southeastern region, especially in the SP state. We concluded that the uneven participation in basketball in Brazil is caused by the continental dimensions of the country and the modality historical context. Concentrating basketball clubs on a single region or state (SP) leads to an underuse of the sporting potential in the country.

Key words: Athletes; Basketball; Brazil; Sports psychology.

Resumo – O presente estudo investigou o efeito do local de nascimento em ambos os sexos do basquete brasileiro e de acordo com os estados e regiões geográficas. Nós hipotetizamos que o estado de São Paulo (SP) seria o principal responsável pelo destaque da região sudeste sobre as demais regiões. O efeito do local de Nascimento dos atletas brasileiros participantes da Copa do Mundo da FIBA e de duas ligas nacionais foram coletados de sites com acesso livre. Os locais de nascimento de 315 atletas foram incluídos. As frequências absolutas e relativas do local de nascimento dos atletas em cada estado e região geográfica foram calculadas. O teste de chi-quadrado foi usado para comparar as frequências esperadas e observadas entre regiões e estados. A razão de chances e o intervalo de confiança de 95% foram calculados para indicar a probabilidade de um atleta de alto rendimento nascer em determinada região ou estado. Os resultados confirmaram nossas hipóteses, apontando altas frequências de atletas nascidos na região Sudeste, especialmente no estado de SP. Concluímos que a desigualdade de participação no basquete brasileiro é causada pela dimensão continental do país e pelo contexto histórico da modalidade. A concentração de clubes de basquete em uma única região e estado (SP) levam a subutilização do potencial esportivo do país.

Palavras-chave: Atletas; Basquetebol; Brasil; Psicologia do esporte.

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INTRODUCTION

Brazil is a very populous country (211 million inhabitants) and has a continental territory (more than 8 million km²) with enormous potential for sport development. Basketball has reached expressive results in the world scenario, such as in the FIBA World Championship (male: gold in 1959 and 1963; female: gold in 1994) and the Olympic Games (male: bronze in 1948, 1960 and 1964; female: silver in 1996, bronze in 2000, fourth position in 2004). Moreover, Brazilian athletes often participate in other top basketball leagues such as NBA (National Basketball Association – USA) and Liga Endesa/ACB (Asociación de Clubs de Baloncesto – Spain). However, the Brazilian basketball performance has dropped over the last decades, with no significant results for women's national teams in the last 20 years and for men's teams in the last 60 years. The underdevelopment of sport over the whole country can restrict national performance in the context of increasingly higher competitiveness of world sport¹. Previous studies have shown that São Paulo state (SP)² and the Southeastern region³ in general concentrate most of the sport facilities and stands out in the promotion of sports in the country.

The Personal Assets Framework^{4,5} discusses key elements of sport engagement that lead to long-term participation, high-level competition, and personal development, defending that taking part in activities (what) while establishing relationships with others (who), in a specific setting (where), makes a difference in the athlete's long-term development⁵. In this scenario, the birthplace effect describes that the features of an athlete's hometown can influence their development towards high-level performance^{5,6}. For example, Côté et al.⁶ showed that children born in small towns in America or Canada were more likely to reach high-level sport than children born in large cities due to the better and more practice, favored by higher quality sport facilities in relation to small towns. Some authors also suggested that community density⁷ and proximity to high-level sport clubs⁸ could influence the development of high-level players; in addition, a recent definition of the phenomenon concluded that the birthplace effect is the critical role that a child's birthplace has on sports participation⁹. In Brazil, several qualitative studies showed a higher probability of male¹⁰ and female^{11,12} athletes born in the Southeast becoming a high-level basketball player, especially those born in SP, due to the higher concentration of basketball clubs in the region¹⁰. Cunha et al.¹⁰ analyzed the profile of the male players competing in the 2014/2015 season of the most important national competition (New Basketball Brazil – NBB) and indicated that the clubs most responsible for NBB athletes' development were *Franca* (São Paulo), *Pinheiros* (São Paulo) and *Minas Tênis Clube* (*Minas Gerais*). Ziani et al.¹³ showed that 69% of the teams participating in the NBB over the last 10 years are from the Southeastern region. In addition, Galatti et al.¹¹ investigated the career of seven Brazilian female basketball athletes who are world champions and/or Olympic medalists. All of them were born in SP.

To the best of our knowledge, the very few quantitative studies on the birthplace effect and athlete's development in Brazilian basketball address only the birthplace of athletes belonging to national leagues (such as NBB) or included participants of only one sex. To support sports policy, it is essential to know the number of athletes who come from different parts of the country and understand the factors influencing the development of high-level players (e.g., distribution of financial and human resources). Knowing the birthplace effect in Brazil may also help to identify the places that hold the best conditions for sport development and stimulate the spread of these conditions over the country.

Thus, this study aimed to investigate the birthplace effect on both male and female Brazilian basketball players participating in national competitions and the FIBA World Cup, according to their states and geographical regions. Our hypotheses were threefold: 1) the birthplace effect affect both male and female athletes; 2) the Southeastern region is the main Brazilian region responsible for developing high-level basketball players; 3) the state of SP is the most responsible for the status of the Southeastern region over the other regions.

METHOD

Data collection

We collected the names and birthplaces of Brazilian players competing in all editions of the basketball FIBA World Cup (Senior), NBB 2019/2020 season, and Woman's Basketball League (*Liga de Basquete Feminino – LBF*) 2019/2020 season from open-access internet websites¹⁴⁻¹⁶. Since the data collection was not based on any experimentation, no ethical issues were involved. In addition, other studies¹⁷⁻²¹ have reported using open-access or internet data and a code was given for athletes' identification to ensure anonymity and confidentiality. 242 of the 557 basketball players initially included in this study were excluded for different reasons (missing data, athletes not born in Brazil, repeated data), generating a total of 315 athletes. Considering that several athletes participated in more than one FIBA World Championship edition or in both FIBA World Championship and NBB or LBF, we used the athlete's first participation in the FIBA World Championship to avoid repeated data in the analyses.

Procedure

We divided the players' birthplaces into five geographical regions (Northern, Northeastern, Mid-western, Southeastern, and Southern) and compared the expected and observed frequencies of athletes born according to: a) the five regions; b) the Southeastern States (which are: SP, Rio de Janeiro, Minas Gerais, and Espírito Santo); c) the five regions, except SP; d) SP isolated and the five regions, and e) SP and all the other states within the Southeastern region.

Statistical analysis

We calculated the absolute and relative frequencies of athletes' birthplaces according to their states and regions. Chi-Square tests were performed to compare the frequencies of birthplaces within each region and state with the expected frequencies. Odds ratio (OR) analyses were performed to determine the probability of an athlete to become a professional player based on birthplace. OR and 95% Confidence Intervals (CI)²² were calculated by comparing the relative frequencies of birthplaces per region (i.e. Southeastern versus Southern, Southeastern versus Northeastern, Southeastern versus Mid-West, and Southeastern versus Northern) or per state within a region (e.g., SP versus Rio de Janeiro, SP versus Minas Gerais, SP versus Espírito Santo). The odds ratios were interpreted as effect sizes following the criteria outlined by Olivier and Bell²³: values of 1.22, 1.86, and 3.00 indicate small, medium, and large effects, respectively. These procedures are

effective in showing participation inequalities and how much certain factors are likely (such as birthdate or birthplace) to influence athletes' success in sport^{22,24,25}. Statistical analyses were performed on the R Studio software, Version 1.1.463 for Windows, which is an integrated development environment (IDE) for R. Statistical significance, set at $\alpha = .05$ for all tests.

RESULTS

The number of players born in each state is represented in Figure 1. 188 athletes were born in SP (103 male), 38 in Rio de Janeiro (24 male); 17 in Minas Gerais (14 male); 12 in Paraná (3 male); 9 in Rio Grande do Sul (8 male) and Santa Catarina (4 male); 8 in Bahia (7 male) and Distrito Federal (7 male); 6 in Espírito Santo (6 male); 4 in Maranhão (0 male) and Pernambuco (3 male); 3 in Mato Grosso do Sul (1 male); 2 in Mato Grosso (2 male); 1 in Rio Grande do Norte (1 male), Sergipe (1 male), Piauí (0 male), Paraíba (1 male), Pará (0 male), Goiás (1 male), and Ceará (1 male).

The Chi-square test showed the birthplace effect in all the analyses, indicating significant differences between the expected and observed distributions of birthplaces according to the geographical region [Male: $\chi^2(3) = 286.82$, $p < 0.001$; Female: $\chi^2(4) = 289.11$, $p \leq 0.001$; entire sample: $\chi^2(4) = 692.95$, $p \leq 0.001$] (Figure 1). The ORs showed large effects for all comparison [OR (95%CI) Southeastern vs. Southern = male, 9.80 (4.87-19.73); female, 6.80 (3.16-14.65); entire sample, 8.30 (4.96-13.89); OR (95%CI) Southeastern vs. Northeastern = male, 10.50 (5.15-21.42); female, 17.00 (6.34-45.60); entire sample, 12.45 (7.01-22.10); OR (95%CI) Southeastern vs. Mid-western = male, 13.36 (6.23-28.68); female, 34.00 (9.55-121.10); entire sample, 17.79 (9.36-33.79); OR (95%CI) Southeastern vs. Northern = female, 51.00 (11.36-228.86); entire sample, 124.50 (29.66-522.65)].

For the Southeastern region (Figure 2), the Chi-square test also showed the birthplace effect in all the analyses, indicating significant differences between the expected and observed distributions of birthplaces in the different states [Male: $\chi^2(3) = 163.67$, $p \leq 0.001$; Female: $\chi^2(2) = 118.39$, $p < 0.001$; entire sample: $\chi^2(3) = 349.84$, $p \leq 0.001$]. The ORs indicated large effects for all comparisons [OR (95%CI) São Paulo vs. Rio de Janeiro = male, 4.29 (2.27-8.11); female, 6.14 (2.80-13.45); entire sample: 4.97 (3.03-8.16); OR (95%CI) São Paulo vs. Minas Gerais = male, 7.36 (3.58-15.12); female, 28.67 (8.03-102.39); entire sample, 11.12 (6.05-20.43); OR (95%CI) São Paulo vs. Espírito Santo = male, 17.17 (6.70-43.98); entire sample, 31.50 (12.99-76.38)].

After removing the state of SP from the analysis, the Chi-square test still indicated the birthplace effect in all analyses, showing significant differences between the expected and observed distributions of birthplaces in the different regions [male: $\chi^2(3) = 34.00$, $p < 0.001$; female: $\chi^2(4) = 22.47$, $p \leq 0.001$; entire sample: $\chi^2(4) = 78.55$, $p \leq 0.001$] and birthplace (Figure 3). The ORs pointed to a small effect when comparing the Southeastern and Southern regions for female athletes [OR¹ (95%CI) = 1.13 (0.36-3.60)]; medium effects when comparing the Southeastern and Southern regions for male athletes and in the entire sample [male, OR (95%CI) = 2.93 (1.20-7.16); entire sample: OR (95%CI) = 2.03 (1.00-4.12)], and between the Southeastern and Northeastern regions for female athletes [OR (95%CI) = 2.83 (0.76-10.52)]; large effects appeared in all the remaining comparisons [OR (95%CI) Southeastern vs. Northeastern = male, 3.14 (1.28-7.75); entire sample, 3.05 (1.44-6.46); OR (95%CI)

Southeastern vs. Mid-western = male, 4.00 (1.56-10.27); female, 5.67 (1.22-26.33); entire sample, 4.36 (1.95-9.73); OR (95%CI) Southeastern vs. Northern = female, 8.50 (1.50-48.05); entire sample, 30.50 (6.71-138.56)].

The Chi-square test showed the birthplace effect for both sexes, indicating significant differences between the expected and observed distributions of birthplaces considering the different geographical regions and SP isolated (Figure 4) [Male: $\chi^2(4) = 162.92, p < 0.001$; Female: $\chi^2(5) = 237.05, p \leq 0.001$; entire sample, $\chi^2(5) = 460.61, p \leq 0.001$]. Except for the comparison between SP and the Southeastern region for male athletes, which showed a medium effect [OR (95%CI) = male, 2.34 (1.27-4.31)], all the other ORs presented large effects [OR (95%CI) SP vs. Southeastern = female, 5.00 (2.25-11.11); entire sample, 3.08 (1.91-4.98); OR (95%CI) SP vs. Southern = male, 6.87 (3.29-14.33); female, 5.67 (2.50-12.82); entire sample, 6.27 (3.64-10.80); OR (95%CI) SP vs. Northeastern = male, 7.36 (3.48-15.54); female, 14.17 (5.08-39.50); entire sample, 9.40 (5.16-17.13); OR (95%CI) SP vs. Mid-western = male, 9.36 (4.22-20.77); female, 28.33 (7.72-104.02); entire sample, 14.46 (7.32-28.57); OR (95%CI) SP vs. Northern = female, 42.50 (9.23-195.69); entire sample, 94.00 (22.15-398.86)].

The comparison between SP and all the other states together (Figure 5) through the Chi-square test showed the birthplace effect on female athletes and in entire sample analyses, indicating significant differences between the expected and observed distributions of birthplaces in SP and all the other states together (female: $\chi^2(1) = 13.78, p \leq 0.001, OR = 1.98, 95\% CI = 1.19-3.27$; entire sample: $\chi^2(1) = 11.81, p = 0.001, OR = 1.48, 95\% CI = 1.08-2.03$).

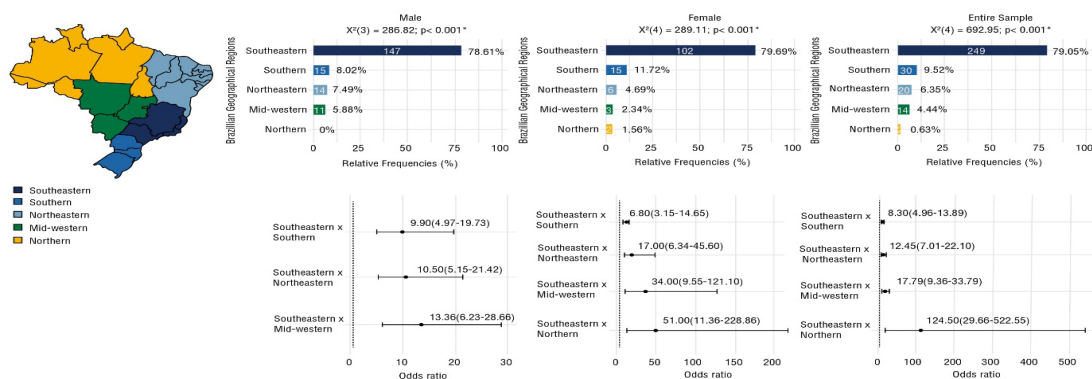


Figure 1. Frequencies of birthplaces of Brazilian male and female basketball players according to their geographical regions.

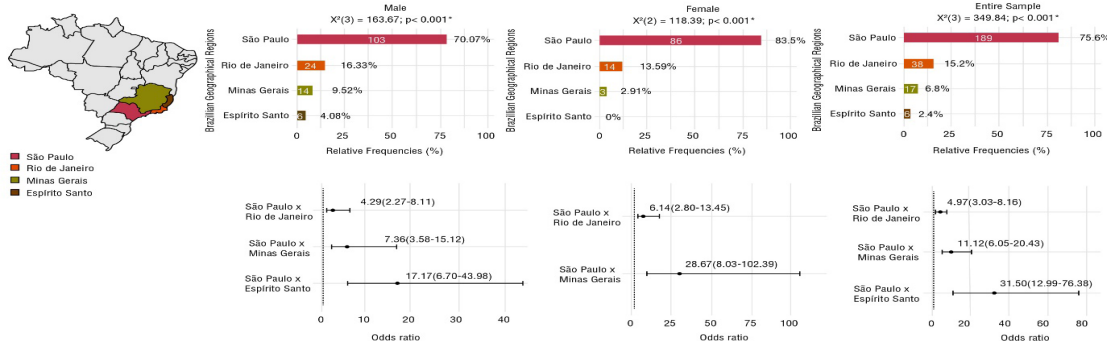


Figure 2. Frequencies of birthplaces of Brazilian male and female basketball players in the Southeastern states.

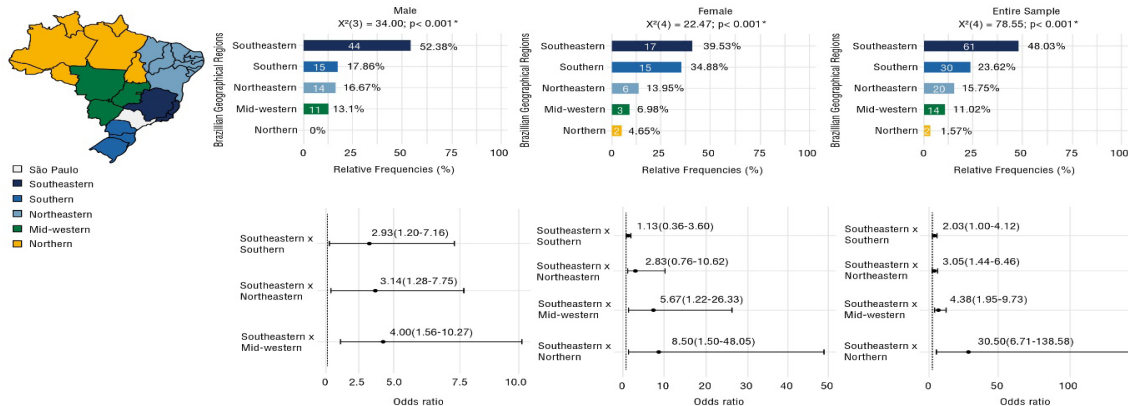


Figure 3. Frequencies of birthplaces of Brazilian male and female basketball players according to their geographical regions (Southeastern region, except São Paulo).

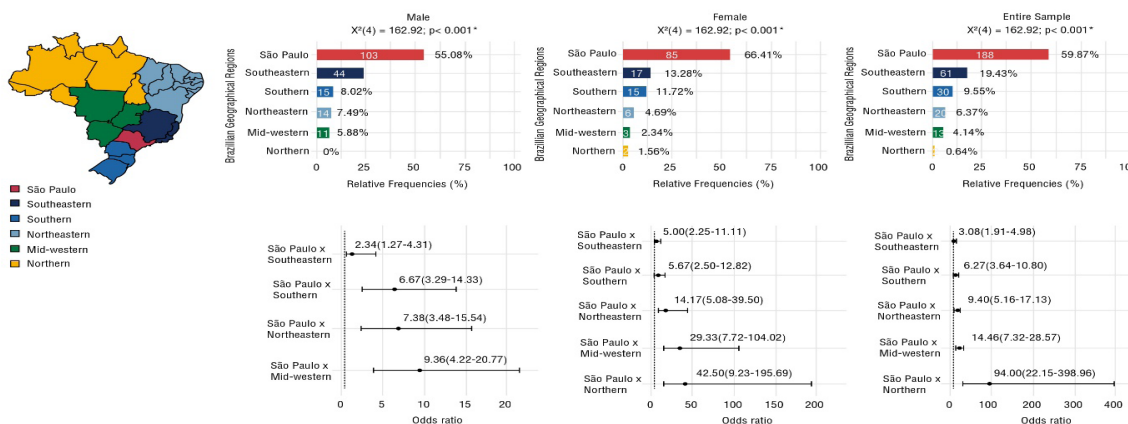


Figure 4. Frequencies of birthplaces of Brazilian male and female basketball players according to their geographical regions and the São Paulo state isolated.

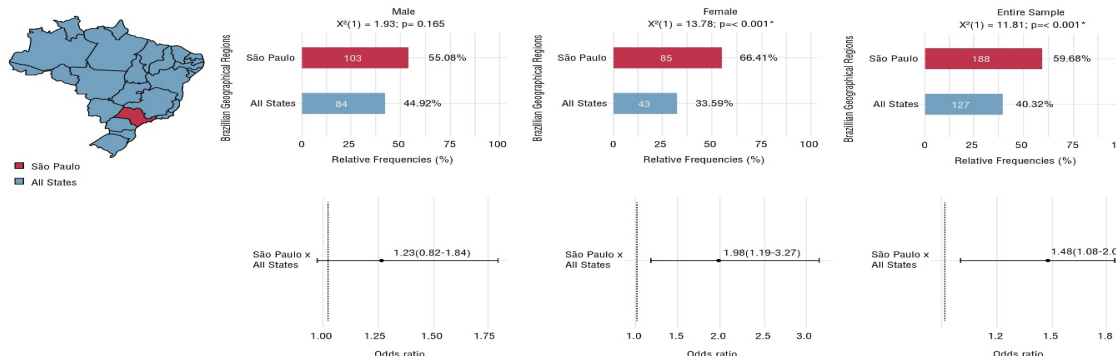


Figure 5. Frequencies of birthplaces of Brazilian male and female basketball players in the São Paulo state isolated and all other states together.

DISCUSSION

This present study aimed to investigate the birthplace effect on Brazilian basketball based on the following our hypotheses: 1) the birthplace effect

affects both male and female athletes; 2) the Southeastern region is the main responsible for developing high-level athletes; 3) the state of SP is the most responsible for the status of the Southeastern region over the other regions. Our results completely confirmed our hypotheses, demonstrating that high-level basketball athletes – male or female – are much more likely to come from the Southeastern region, especially the São Paulo state, in relation to the other regions in the country.

The birthplace effect comprises relevant contextual variables – such as characteristics of the athletes' birthplace – that optimize high-level athletes' development⁷. Community density^{7,8} represents the number of inhabitants per area and can be more accurate at assessing the birthplace effect than community size⁷. Studies have indicated that less dense communities can favor athletes' development due to greater opportunities for deliberate physical activity or sports practice^{26,27} and fewer concerns about safety²⁷. However, density seems to be directly correlated to involvement in Brazilian basketball, with the densest regions presenting the highest frequencies of birthplace among high-level players. According to the Brazilian Institute of Geography and Statistics, the SP state is the third most densely populated state in the country after Distrito Federal (Mid-western region) and Rio de Janeiro (Southeastern region)²⁸. Therefore, density does not explain the birthplace effect on Brazilian basketball.

In contrast, Rossing et al.⁸ observed that high-level athletes tend to come from communities near high-level sport clubs, which probably explains our results. We noticed that 14 (9 in NBB; 5 in LBF) out of the 24 teams (16 male – NBB – and 8 female – LBF) participating in NBB and LBF 2019/2020 season were from the SP state, while 10 came from the other states (NBB, 2 in Rio de Janeiro, 1 in Ceará, Minas Gerais, Paraná, Paraíba and Distrito Federal; LBF, 1 in Rio de Janeiro, Maranhão, and Santa Catarina). Ziani et al.¹³ carried out a documental analysis that reinforces such concentration pattern, pointing out that in 10 years of NBB, 32 teams participated at least once in the competition: none were from North, 6% Northeast, 6% Mid-West, 6% South, and 69% from Southeast.

In addition, the vast territory of Brazil makes it difficult for athletes to move from one region to another. Although some high-level clubs provide financial support for talented low-income athletes, they cannot afford the expenses of all athletes who need to move from one city to another, especially at early ages. Therefore, a child born in a state without any high-level clubs may find barriers (e.g., lack of home-club transport, lack of financial or emotional support) to experience high-quality training⁸. In contrast, a child born in a region with good sport facilities may develop the features (e.g., interest, motivation, skill development, community pride, and positive social norms) that increase their chances to become a high-level player²⁷. Another possible explanation for the birthplace effect on Brazilian basketball may be related to the history of the sport in Brazil. According to the literature, Brazil was the first Southern American country to practice basketball, which was introduced by the American teacher Auguste Shaw in 1894, in a school called Mackenzie, placed in the city of SP²⁹. Specifically among women, in 1906 basketball was part of the Physical Education curriculum at the São Paulo City Normal School of Teachers for Women, attending young women from all around the state, who spread the sport around³⁰. The earlier implementation of basketball in SP and places nearby allowed a longer period for basketball to develop in the region, and then spreading to the other regions. Thus, the higher

number of basketball clubs in SP and the Southeastern region may increase the number of practitioners, as well as enhance competitiveness and the sport level that can be reached by an athlete born in those places. The higher the number of athletes and the level of competitiveness in sports practice the greater the stimulus for higher level players to develop¹⁷.

Some limitations are involved in this study, such as the exclusion of a few athletes due to missing birthplace information and inaccurate information on the city of birth of a few athletes, which led us to use the state of birth instead of the city of birth. However, to the best of our knowledge, this is the first study to show quantitative data about the birthplace effect on Brazilian basketball, indicating the better conditions of SP state and the Southeastern region to develop high-level athletes than the other regions. Therefore, basketball athletes wishing to become professional players may increase their chance of success by moving to the Southeastern region, especially SP, which may lead them to play at a higher level and be closer to important high-level clubs and professional players. For youngsters in basketball, partnerships between high-level and small clubs may help the development of training strategies for talented players and postpone city change, avoiding the lack of family support at early ages. Also, sporadic training in high-level clubs during school vacations may allow children to experience high-quality training and be in the presence of top athletes, in addition to understanding the training intensity and improvement required. Finally, sport policies should create conditions to encourage the practice and development of basketball in all regions in the country. A better distribution of financial and human resources (e.g., coaches, sport scientists) over the whole territory could benefit the development of better sport conditions, increase access to basketball practice, and improve Brazilian basketball performance in the world scenario.

CONCLUSIONS

The birthplace effect is experienced by both male and female basketball players in Brazil, with the Southeastern region – especially SP state – mostly contributing to the formation of high-level basketball athletes. The unequal participation in Brazilian basketball probably results from the continental dimension and historical context of the country, which led to a higher concentration of basketball clubs in a single region, mainly in a single state, suggesting an underuse of its sporting potential.

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COMPLIANCE WITH ETHICAL STANDARDS

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Ethical approval

This research is in accordance with the standards set by the Declaration of Helsinki.

Conflict of interest statement

The authors have no conflict of interests to declare.

Author Contributions

LOF, SGTB, and MRA conceived and designed the experiments. LOF and AIR collected the data. LOF and MRA analyzed the data. LOF and MRA contributed with reagents/materials/analysis tools. LOF, SGTB, AIR, LRG and MRA authored the paper.

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