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Original Article

THE RELATIVE AGE EFFECT ON BRAZILIAN ELITE VOLLEYBALL

O EFEITO DA IDADE RELATIVA NO VOLEIBOL BRASILEIRO DE ELITE

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ABSTRACT
The relative age effect (RAE) refers to the advantage of the athletes born on the first months of the sport selection period compared to those born months later during such a selection process, which tends to favor athletes who are in a more developed maturational stage or those who have more advanced physical development compared to their younger counterparts born in the same year. This advantage occurs mainly in sport whose physical characteristics are determinant for obtaining success, such as volleyball, which leads to the premature exclusion or dropout of potential talents from sport. This study aims at assessing the RAE presence in Brazilian men's and women's elite volleyball by analysing the number of athletes who were born in each trimester of the year and had been ranked to the main national Super Leagues. The results showed no effect related to the RAE in Brazilian women's elite volleyball, whereas there was a higher representation of male athletes born in the first trimester compared to the ones born on the 3rd and 4th trimesters. These results point to a need for better understanding the causes and consequences of RAE in Brazilian men's volleyball in order to avoid premature exclusion or dropout of potential talents, thus, enabling an even greater development of this sport in the country.
Keywords: Age Groups. Volleyball. Athletic Performance.

RESUMO
O efeito da idade relativa (EIR) refere-se à vantagem de atletas nascidos nos primeiros meses do período de seleção em relação a seus pares nascidos em meses posteriores no processo de seleção esportivo, que tende a favorecer atletas que encontram-se em estágio maturacional ou de desenvolvimento físico mais avançados que o de seus colegas mais jovens nascidos no mesmo ano. Esse favorecimento ocorre principalmente em esportes cuja característica física é determinante para se obter sucesso, como o voleibol, acarretando na exclusão ou abandono prematuro da modalidade por parte de talentos em potencial. O objetivo do estudo foi avaliar a presença do EIR no voleibol brasileiro de elite feminino e masculino, pela análise da distribuição do número de atletas rankeados para as Superligas masculina e feminina nascidos em cada trimestres do ano. Os resultados indicaram não haver EIR no voleibol feminino brasileiro de elite, enquanto no masculino há uma maior representação de atletas nascidos no primeiro trimestre em comparação àqueles nascidos nos 3º e 4º trimestres. Esses resultados apontam para a necessidade de se entender melhor as causas e consequências do EIR no voleibol masculino brasileiro, afim de evitar a exclusão ou abandono precoce do esporte de possíveis talentos, permitindo um maior desenvolvimento da modalidade no país.
Palavras-chave: Grupos etários. Voleibol. Desempenho Atlético.

Introduction

Volleyball is a sport with intermittent demands and a predominant use of the anaerobic alactic energy system at the decisive moments of the match, since it intersperses explosive high-intensity actions with moments of low intensity[1]. These actions are mainly expressed by jump movements, blocks and attacks, which demand a great muscle strength of the upper and lower limbs[2]. Therefore, more well-succeeded volleyball teams usually have not only technical and tactical superiority, but also a physical[3] distinction; the later has been shown to be increasingly decisive when selecting the athletes[4].

Petroski et al.[5] found that athletes of the Brazilian men's volleyball adult team became significantly higher and had more muscle mass over a period of 11 years. That is due to having a higher stature, which is a primordial factor for achieving the high level in current volleyball[6], together with the lower limbs muscle strength, which is required to the hundreds of jumps performed during the match, especially in blocks and serves. On the other hand, the

greater explosive muscle strength of the upper limbs optimizes the most effective actions, such as the power of ball contact. These characteristics are highly desirable for succeeding in this sport[5].

The need imposed to clubs and sport schools to achieve victorious results even when dealing with junior teams[7] may lead to the selection of children and teenagers mainly based on their stature and muscle strength, which may result in the exclusion of those in later maturational stages[8].

Considering the influence of maturational issues when selecting future sportsmen, a variable is emphasized by several studies, that is, the relative age effect (RAE), which refers to the possible advantage given to athletes born in the first months of the selection year[9,10]. This is due to the fact that as they are grouped according to their year of birth, their maturational stages and, consequently, their stature and physical capacity tend to be more developed compared to their counterparts born some months later[8].

Apart from competition, the disadvantage of the athletes born in the last months of the year may result in their exclusion or dropout from sport, which leads them not to achieve other social or psychological benefits, pursued by young children and teenagers when practicing and joining a sport team[11]. The feeling of self-efficacy of these athletes, for example, may be reduced[12], which may result in a diminished attendance of these individuals in physical activity programs[13,14]; an effect that may be prolonged until the adult life[15].

When analysing collective sport, it can be seen several studies that have investigated this theme in relation to some sport, such as, soccer[10,16], futsal[17], basketball[18], and hockey[19] . However, only four studies involving volleyball athletes were found [9,20-22].

The study by Nakata and Sakomoto[20] included Japanese elite volleyball adult athletes of both sexes and identified the relative age effect only in women. Grodin et al.[9], in turn, found no relative age effects in Canadian volleyball players of several categories, neither for men nor for women. On the other hand, Campos et al.[21] showed a prevalence of male volleyball players born on the first semester of the year among the players who competed the 2015 world championship in all the categories assessed (under-19, under-21 and under-23), with the most consistent effect appearing in the younger categories, whereas in the elite world cup of the same year the RAE was not found. Okazaki et al.[22] evaluated the Brazilian young female volleyball players under 14 years of age and showed a significantly higher number of girls born on the two first trimesters of the selection year. However, one cannot infer that the RAE presence on women's Brazilian volleyball reported by the authors is maintained up to the adult highest levels.

The number of studies involving female athletes is also scarce[23]. In general, differences between men and women have been found in respect to the type of sport in which RAE occurs for each of them[20], either in the presence or not of the relative age effect in the same sport[10, 24], and to the strength of such effect[25], which demands a separate investigation of the RAE in relation to the sexes.

The results involving RAE in women are still controversy. Some of them show a strong presence of this effect in all categories of a same sport, such as hockey and soccer[19,23], whereas others identified a decrease or even an elimination of the RAE with the increase of the age group when considering a same female collective modality, such as in handball and basketball[18,26], or they found no biased distribution among the four birth trimesters[27].

Considering the relevance of acknowledging the presence of the RAE in the process of selecting volleyball athletes to a greater development of this sport, in addition to the need of investigating this subject between sexes, separately, the present study aims at assessing the presence of the relative age effect in Brazilian men's and women's elite volleyball.

Methods

Sample

The sample consisted of the date of birth of 314 athletes, 179 men and 135 women ranked, that is, officially able to compete in the men's and women's Super Leagues in the 2016/2017 season of the Brazilian Volleyball Confederation (CBV), which are the main Brazilian national tournaments.

Procedures

This study applied similar methods of previous studies[17,18] by collecting data directly from the official CBV website. On this website there are documents released to the press about the official ranking of all the 314 Brazilian athletes of the men's and women's Super Leagues in the 2016/2017 season, including their dates of birth. The data were tabulated in a spreadsheet, and the analysis was carried out by considering the athletes' trimesters of birth, which is a traditional form of analysis[16,21]. The first trimester comprises the athletes born in January, February and March; the second one includes athletes of April, May and June; the third trimester embraces the athletes of July, August, and September, whereas the fourth trimester includes those born in the last three months of the year.

Statistical Analysis

A Chi-Squared test was used to compare the differences of the proportion of births among the four trimesters. A subsequent analysis of proportion 2x2 with Bonferroni correction in each quartile was carried out to point out the direction of the potential differences. The significance level adopted was $\alpha = 5\%$.

Results

The results found in relation to the distribution of the birth quartiles of men and women are shown by means of the absolute and relative numbers of the athletes in each quartile in Figure 1.

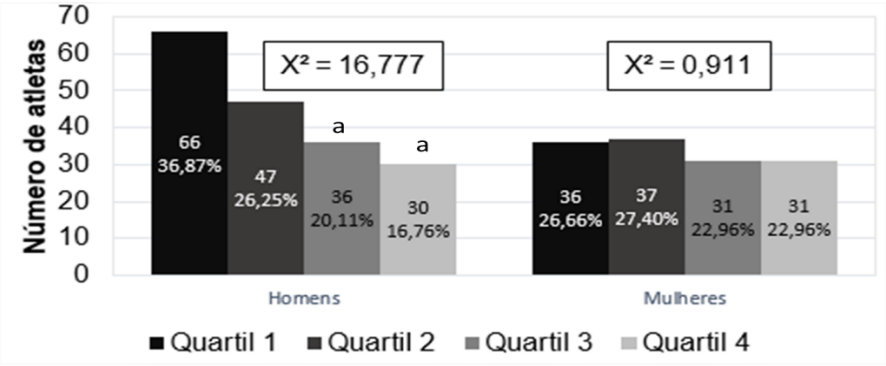

Figure 1. Distribution of the birth quartiles of the male and female athletes ranked for the 2016/17 Super Leagues.

Caption: a – difference for the first quartile ($p < 0.0001$)
Source: The authors

When comparing the trimesters of birth of men by using the proportion analysis and applying Bonferroni correction (p value adjusted to $p < 0.00833$), significant differences were found between the 1st x 3rd quartile ($p < 0.0001$), and 1st quartile x 4th quartile ($p < 0.0001$).

Discussion

The present study aimed at analysing the presence of the relative age effect in Brazilian men's and women's elite volleyball. The results showed a balanced distribution of the number of births in the four trimesters for female volleyball players, and a greater representation of male athletes born in the first trimester compared to those born on the 3rd and 4th trimesters.

Therefore, data showed that Brazilian men's elite volleyball also has the RAE. This effect has been shown to be prominent in some sport, such as volleyball, in which physical characteristics are determinant for their players[28]. A possible explanation is that the maturational differences on this type of sport influence the selection of the athletes in younger categories, possibly prematurely excluding talents whose maturation occurred later compared to those born in earlier quartiles[24]. In general, younger athletes have a lower stature and less muscle mass, which are characteristics strongly related to the maturational stage[5,6].

Since these athletes are often wrongly identified as less talented then their counterparts with more vigor and physical structure, several of them suffer from exclusion or dropout of sport; the latter is associated to psychological factors as motivation and self-efficacy[29], thus, not reaching the adult category[23] in which the relative age effect is reflected, although later these athletes may potentially have a physical performance similar to those that continued in the sport[24].

The results of the present paper differ from the ones found in the studies by Nakata and Sakomoto[20] and Grodim et al.[9], which did not identify the RAE in male volleyball players from Japan and Canada, respectively. However, it is pointed out that this effect is more commonly found in regions where a given sport is highly popular and competitive[29]. Competitiveness is defined[30] as the number of athletes susceptible to participate in a given sport; this number is related to the popularity of such a sport in a certain region. The importance of the number of available athletes is exemplified in the study by Cobley et al.[31], which highlighted the impact of a substantial decrease of the male population and, thus, of available athletes in the RAE of the German professional soccer. The high popularity[32] and, consequently, the competitiveness of the Brazilian volleyball compared to the Japanese and Canadian ones may explain the differences of the results found among the studies.

The persistence of the RAE in Brazilian men's elite volleyball points to a possible national problem in the selection process of athletes that may result in potentially detrimental consequences for the development of this sport in Brazil, since it challenges the world volleyball tendency in which the distribution of the dates of birth is balanced in athletes who reach the elite[21]. The greater exclusion of the athletes born on the second semester of the selection year may prevent either the development or the detection of several other athletes that could reach the world elite and contribute to the development of Brazilian men's volleyball.

The women's volleyball, in turn, showed no RAE, which differs from the study by Okazaki et al.[22] that identified a strong RAE in the Brazilian female volleyball players who were under 14 years of age and had participated in an international volleyball tournament in 2005. However, the union of both studies support other researches that pointed out the RAE in young women's categories at the same time that they did not find this effect in postpubescent categories[18,25,33]. This difference may occur because of the maturational particularity of women who reach the maturational state in earlier ages if compared to men8.

The study by Marques et al.7 showed that the greatest part of the male Brazilian volleyball players initiated in systematic training and tournaments after being 14 years old, which indicates that this main selection period occurs after the age studied by Okazaki et al.[22],

when the greatest part of the girls is in a more developed and uniform maturational stage[34]. This implies in a non-relative age effect on the adult elite category. According to Vincent and Glamser[27], primordial characteristics also in women's volleyball, such as stature, resistance and muscle strength are developed in female young children differently from the male ones up to approximately the age of 13 years, when they reach a plateau. Therefore, considering the age group studied by Okazaki et al.[22], the older athletes have still being favored due to this maturational advantage, which would be equalized in older age groups afterwards.

Another possible explanation that has been pointed out by the literature when considering the smaller or inexistent relative age effect found in female groups of athletes is related to sociological issues[28]. The girls who prematurely develop compared to their counterparts may suffer from a process of social pressure and inhibition[27], as culturally the women's body understood as ideal is opposite to the one that is considered ideal for sport[35]. These undesirable corporal changes, such as the increase of arm and thighs circumferences in volleyball athletes[36] may, thus, result in the dropout from sport. Therefore, athletes with later development could have more time and possibilities to be technically and tactically greater developed[27,35].

In addition, studies suggest that, opposite to the male sex, the female maturation would tend to add some physical characteristics that are detrimental to the sport performance, such as larger hips and a higher index of body mass[27]. Therefore, Okazaki et al.[22] suggest that athletes who were part of their study were not in an advanced maturational process enough to influence their performance yet. It could be suggested that another possibility for the advantage of older athletes in prepubescent groups could rely on the benefits of a possibly more advanced motor development of the young athletes born in the first and second quartiles in relation to those born later in the same year. This advantage would be, then, progressively equalized in older categories.

It is necessary to work in order to elucidate which of these possibilities and several others are really preponderant for either diminishing or eliminating the relative age effect on female adult categories, as it can be a good indicator according to which one can establish effective actions to either minimize or cease the relative age effect on younger women's categories and on men's categories, strengthening Brazilian volleyball even more.

An important point to be considered in further studies on the RAE, and that is shown as a limitation of the present study, is specifically assessing the athletes' maturation, but not only considering their chronological ages, as they may not necessarily coincide[30]. Therefore, a better inference may be reached about the real effects of the athletes' maturation on their selection for competitive volleyball teams. Moreover, the investigations should also include the analysis of the distribution of birth dates and maturation of sport dropouts, or even compare this distribution in relation to the starters and backups of the volleyball teams in order to obtain a better conclusion regarding the causes and implications of the RAE in this sport. Considering soccer, for example, it was shown that athletes born in the first semester have more game time[37], and that those born in the second semester seem to go through a strategic adaptation, migrating to a sport with less physical requirements or to other forms of sport participation, such as refereeing[38].

In general, the presence of the RAE in men's volleyball shown in this study points to the need of clubs and federations to identify the factors responsible for this result, with the intention of either eliminating or minimizing this effect, thus, assuring a non-premature exclusion of potential talents born in the second semester of the year, and a more fair and effective selection, since their physical disadvantages are normally not long-lasting[8,35] and the idea of talent overpass the physical superiority.

Conclusions

The present study came to the conclusion that the relative age effect is not found in Brazilian women's elite volleyball, however, it is seen in men's volleyball, which shows a biased distribution of the athletes' birth dates; the first trimester is significantly different from the third and fourth trimesters. These results reinforce the need for working towards a fully understanding of the causes and consequences of the presence of the RAE in Brazilian volleyball in order to avoid the premature sport exclusion or dropout of potential talents, which will minimize their possible psychological and social damages, in addition to allowing a greater development of this sport in Brazil.

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