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ORIGINAL ARTICLE

Relative age effect in Olympic basketball athletes

Effet de l'âge relatif chez des joueurs de basket-ball de niveau olympique

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Relative age;
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Summary
Objective. — To investigate the relative age effect (RAE) in Olympic basketball athletes, related to sex, continent and country.
Methods. — The sample was composed of 300 athletes who have competed in the London 2012 Olympic Games. Athletes' date of birth was split into quartiles (trimester of born). For data analysis, Chi^2 test was used with the level of significance set at 5%.
Results. — The RAE was not observed by the analysis for sex and continent. However, the RAE was found in French athletes ($\chi^2 = 11.333$; $P = 0.01$), with more athletes born on the second quartile. We can conclude that the RAE is not present in Olympic basketball athletes, except on those French ones.

MOTS CLÉS
Âge relatif ;
Athlètes ;
Basket-ball

Résumé
Objectif. — Étudier l'effet d'âge relatif chez les joueurs de basket-ball olympique en fonction du sexe, du continent, et du pays.
Méthodes. — L'échantillon était composé de 300 athlètes qui ont participé aux Jeux Olympiques de Londres 2012. Les dates de naissance des athlètes ont été divisées en quartiles (quart

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de naissance). Pour l'analyse des données, le test de Chi^2 a été utilisé avec un niveau de signification de 5 %.
Résultats. — L'effet de l'âge relatif n'a pas été observé pour le sexe et continent. Cependant, un effet d'âge relatif a été constaté chez les athlètes françaises ($\chi^2 = 11{,}333$, $p = 0{,}01$) avec la plupart des joueuses nées dans le deuxième quartile. En conclusion l'effet de l'âge relatif n'est pas présent chez les athlètes de basket-ball olympique, à l'exception de ceux des athlètes françaises.

1. Introduction

Sport researchers recognize that the month of birth may interfere with the athlete's chance of achieving the high performance due to the relative age effect (RAE) [1,2]. The RAE exists when the birthdate distribution of a selected group of athletes differs from the expected normal distribution, showing an increased representation of athletes born in the first months of the year [3].

The RAE is present in different sports, especially in team sports where performance is dependent on strength, power and body size [1,4,5]. Moreover, this phenomenon seems to be independent of the performance level [4], being more frequent in sports with very competitive selection processes [3]. However, this topic is still controversial in basketball. In youth basketball categories, the RAE was observed in Spain [6] and France [7,8]. In professional athletes, the RAE was observed in Spain [6] and Germany [9], but not in the American athletes [10], both male [6,11] and females [12]. Moreover, there is a lack of research in the potential sex differences on the RAE. The sex differences in the timing and tempo of maturation, especially the moment and intensity of the growth spurt and the social constraints pointed out to the girls, justify this approach.

Considering the above, the aim of this study was to investigate the RAE in Olympic basketball athletes regarding sex, continent and country. The importance of investigating Olympic athletes lies in the fact that these athletes represent the final stage of the elite sports training process and this may reflect what happens in the initial stages of training.

2. Methods

2.1. Data collection

Following the methodology used in previous studies [3,13], the names and birthdates of Olympic basketball athletes were obtained from the official website of the London Olympic Games 2012 (www.london2012.com). Data from 300 athletes from 17 countries were collected, with 147 women (27.1 ± 3.9 years old; 76.0 ± 9.8 kg; 1.84 ± 0.09 m) and 153 men (27.7 ± 3.9 years old; 99.1 ± 11.9 kg; 2.00 ± 0.01 m).

2.2. Procedure

The month of birth of each athlete was categorized into quartiles (Q). The annual calendar from January 1st to December 31st was considered. The 1st quartile (Q1) consisted of the months January, February and March; the 2nd quartile (Q2) included the months April, May and June; the 3rd quartile (Q3) comprised the months July, August and September, and the 4th quartile (Q4) consisted of the months October, November and December. Countries were grouped into five continents according to their geographic location: America, Africa, Asia, Europe and Oceania.

2.3. Statistical analyses

The chi-square (χ^2) was used to test the effect of age distribution in analysis by sex and continent. Fisher exact test was used to test for significant differences in the expected number of births in each quartile in analysis by country. Consistent with previous studies, the expected values were calculated by assuming equal distribution of births in each quartile of the year [3,13]. All tests were performed using the SPSS 19.0 for Windows using a 5% significance level. In multiple comparisons, the alpha significance was adjusted using the Bonferroni method (0.05/6 = 0.008). Therefore, the significance level was $P < 0.008$ for multiple comparisons between quartiles.

3. Results

The birthdate distribution of all athletes ($n = 300$) was not statistically different from the expected distribution for each quartile ($P > 0.05$, Table 1), although statistically significant differences between Q2 and Q1 have been observed in the multiple comparison of quartiles ($P < 0.008$, Fig. 1). Also, there were no significant differences in the distribution of athletes' birthdates by sex and continent ($P > 0.05$, Table 1). However, there was RAE on French athletes when considering the analysis by country, with greater representation of athletes born in the Q2 compared to the other quartiles.

4. Discussion

The aim of this study was to investigate the RAE on basketball athletes of the London Olympic Games 2012 regarding sex, continent, country and performance. The RAE was not observed when considering the sample as a whole nor in the analysis by sex and continent. There was a RAE only on French athletes, with greater representation of athletes born in the Q2 compared to the other quartiles. Furthermore, there was no association between RAE and winning medals.

Table 1 Evaluation of quartiles of basketball athletes' birth of London Olympic Games 2012 by sex and continent using Chi[2] test and by country, using the Fisher's exact test.

	Number and (%) of athletes per quartile					χ^2	*P*
	Q1	Q2	Q3	Q4	Total		
All athletes	63 (21.0)	94 (31.3)	73 (24.3)	70 (23.3)	300	7.120	0.07
By sex							
Male	34 (22.2)	49 (32.0)	37 (24.2)	33 (21.6)	153	4.255	0.23
Female	29 (19.7)	45 (30.6)	36 (24.5)	37 (25.2)	147	3.503	0.32
By continent							
America	14 (19.2)	25 (34.2)	18 (24.7)	16 (21.9)	73	3.767	0.29
Africa	5 (20.8)	8 (33.3)	7 (29.2)	4 (16.7)	24	1.667	0.64
Asia	10 (19.6)	15 (29.4)	11 (21.6)	15 (29.4)	51	1.627	0.65
Europe	28 (21.9)	42 (32.8)	34 (26.6)	24 (18.8)	128	5.750	0.12
Oceania	6 (25.0)	4 (16.7)	3 (12.5)	11 (45.8)	24	6.333	0.11
By country							
Angola	4 (33.3)	2 (16.7)	3 (25.0)	3 (25.0)	12	0.667	0.98
Argentina	2 (16.7)	5 (41.7)	3 (25.0)	2 (16.7)	12	2.000	0.70
Australia	6 (25.0)	4 (16.7)	3 (12.5)	11 (45.8)	24	6.333	0.11
Brazil	7 (29.2)	8 (33.3)	4 (16.7)	5 (20.8)	24	1.667	0.69
Canada	2 (16.7)	4 (33.3)	3 (25.0)	3 (25.0)	12	0.667	0.98
China	7 (29.2)	6 (25.0)	2 (8.3)	9 (37.5)	24	4.333	0.26
Croatia	0 (00.0)	4 (33.3)	5 (41.7)	3 (25.0)	12	0.500	0.93
Spain	4 (33.3)	3 (25.0)	4 (33.3)	1 (8.3)	12	2.000	0.70
USA	3 (12.0)	8 (32.0)	8 (32.0)	6 (24.0)	25	2.680	0.45
France	3 (12.5)	13 (54.2)	3 (12.5)	5 (20.8)	24	11.333	0.01*
Great Britain	5 (20.8)	5 (20.8)	7 (29.2)	7 (29.2)	24	0.667	0.91
Lithuania	6 (40.0)	6 (40.0)	3 (20.0)	0 (00.0)	15	1.200	0.68
Nigeria	1 (8.3)	6 (50.0)	4 (33.3)	1 (8.3)	12	6.000	0.13
Czech Republic	3 (25.0)	3 (25.0)	3 (25.0)	3 (25.0)	12	0.000	1.00
Russia	3 (11.1)	9 (33.3)	9 (33.3)	6 (22.2)	27	3.667	0.32
Tunisia	4 (23.5)	5 (29.4)	6 (35.3)	2 (11.8)	17	2.059	0.63
Turkey	3 (25.0)	3 (25.0)	3 (25.0)	3 (25.0)	12	0.000	1.00

* Significant difference $P < 0.05$, Q2 vs. Q1, Q3 and Q4.

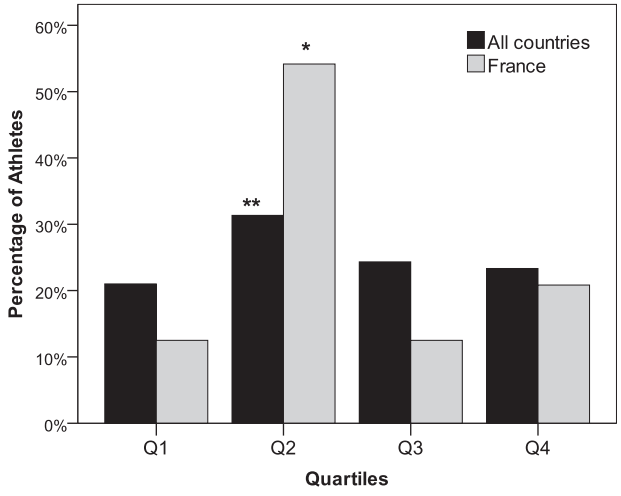

Figure 1 Percentage distribution of quartiles of basketball athletes' birth who competed in the Olympic Games in London 2012 ($n = 300$) and athletes from France ($n = 24$) (*: significant difference $P < 0.05$, Q2 vs Q1, Q3 and Q4; **: significant difference $P < 0.008$, Q2 vs Q1).

The RAE is markedly observed on collective sports like hockey [14], rugby [15] and especially football [4]. According to the literature, this phenomenon is more common in sports whose body size and physical strength are determinants of performance, where selection processes are more competitive and in culturally most popular sports [5]. In basketball, however, this seems not to be the rule. Our results indicate that the context of sport modality and the selection processes of each country are determinant for the occurrence or absence of RAE on basketball.

The presence of the RAE on French Olympic athletes reflects what is observed in the youth categories of this country. Studies on training athletes in France found a significant difference for the RAE on athletes up to 17 years belonging to the French Federation of Basketball [7]. Furthermore, the way and time in which athletes are selected for competition can also be an intervening factor. What is observed in France is an overemphasis of early results, which can generate negative consequences. A recent study found that dropout by the athletes in the last quartiles is greater than that of athletes born on the first quartiles [8]. This suggests that the selected athletes receive training of better quality, greater amount of practice and motivation, while those not selected become unmotivated.

In Spain, the RAE also has strong influence on the selection of future basketball athletes. An effect of relative age was found on the first three divisions of the Spanish basketball [6]. Although such phenomenon loses strength in older ages, it still persists in the Spanish professional basketball. The authors argue that in the younger age groups, the athletes are selected based on advanced maturation that is associated with increased height. In Germany, this phenomenon is also observed [9]. The RAE was not observed on the USA team, confirming the findings of other studies [6,10—12]. In American basketball youth category, there is a system that allows older athletes to play with those younger and it could eventually minimize the RAE on the professional level [10]. Another possible explanation is that the selection of American players is made at older ages, minimizing the maturation influence on physical abilities and performance.

In general, the studies on basketball indicate that RAE has greater influence on the youth age groups. This practice interferes directly with the selection and promotion of talents, even if that effect is not so clear in the adult categories of basketball. Possibly the RAE in the training categories may be associated with sports selection/training focused on early results in competitions. In this sense, it has been common to selection of players born in Q1 and Q2 at this stage where performance is dependent on the strength, power, and body size [1,4,5].

In this study, a limitation of the sample should be considered because there are few countries and do not represent all the diversity of sports training process in basketball. To reduce this effect, it would be interesting to apply the same methodology proposed in this study to the teams/countries participating in the world basketball championship. Some studies show that the RAE does not predict the high performance career [16], does not influence the players selection for national teams [17] and it is not present in some Olympic modalities [13]. On the other hand, in the training categories, those athletes who have higher physical development can excel over the others due to the process of growth, maturation and development.

From the practical point of view, the results of this study suggest that the RAE is not decisive to be a high performance basketball player. Thus, coaches should not overestimate the RAE on the selection processes of their athletes and sport training of basketball. The negative effect of this phenomenon lies mainly in two aspects:

- future talent in the sport can be excluded prematurely due to the preference of coaches for earlier maturing and chronologically athletes;
- sport dropout by those who are not selected, since they receive lower-quality training and have less chance of development.

In conclusion, the RAE is not present on the Olympic athletes of basketball, except in the French. Further studies are needed on the RAE in basketball using samples of male and female teams of world championships, as well as under-17 and under-19 world championships and under-15 and under-17 continental competitions.

Disclosure of interest

The authors declare that they have no competing interest.

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References

[1] Musch J, Grondin S. Unequal competition as an impediment to personal development: a review of the relative age effect in sport. Dev Rev 2001;21:147—67.
[2] Baker J, Logan AJ. Developmental contexts and sporting success: birth date and birthplace effects in national hockey league draftees 2000-2005. Br J Sports Med 2007;41:515—7.
[3] Raschner C, Müller L, Hildebrandt C. The role of a relative age effect in the first winter Youth Olympic Games in 2012. Br J Sports Med 2012;46(15):1038—43.
[4] Cobley S, Baker J, Wattie N, Mckenna J. Annual age-grouping and athlete development: a meta-analytical review of relative age effects in sport. Sports Med 2009;39(3):235—56.
[5] Wattie N, Cobley S, Baker J. Towards a unified understanding of relative age effects. J Sports Sci 2008;26(13):1403—9.
[6] Esteva S, Drobnic F, Puigdellivol J, Serratosa L, Chamorro M. Fecha de nascimento y êxito em el baloncesto profesional. Apunts Medicina de L'esporte 2006;149:25—30.
[7] Delorme N, Raspaud M. The relative age effect in young French basketball players: a study on the whole population. Scand J Med Sci Sports 2009;19(2):235—42.
[8] Delorme N, Chalabaev A, Raspaud M. Relative age in associated with sport dropout: evidence from youth categories of French basketball. Scand J Med Sci Sports 2011;21(1):120—8.
[9] Schorer J, Neumann J, Cobley S, Tietjens M, Baker J. Lingering effects of relative age in basketball players' post athletic career. Int J Sports Sci Coaching 2011;6:143—7.
[10] Côté J, Macdonald DJ, Baker J, Abernethy B. When 'where' is more important than 'when': birthplace and birthdate effects on achievement of sporting expertise. J Sports Sci 2006;24:1065—73.
[11] Daniels TE, Jansen CTL. More on the relative age effect. Can Assoc Health Educ Phys Rec J 1987;53:21—4.
[12] Goldshimied N. No evidence for the relative age effect in professional women's sports. Sports Med 2011;41(1):87—90.
[13] Albuquerque MR, Lage GM, Costa VT, Ferreira RM, Penna EM, Moraes LCC, et al. Relative age effect in olympic taekwondo athletes. Percept Mot Skills 2012;114(2):461—8.
[14] Sherar LB, Baxter-Jones AD, Faulkner RA, Russell KW. Do physical maturity and birth date predict talent in male youth ice hockey players? J Sports Sci 2007;25:879—86.
[15] Till K, Cobley S, Wattie N, OHara J, Cooke C, Chapman C. The prevalence, influencial factors and mechanisms of relative age effects in UK Rugby League. Scand J Med Sci Sports 2010;20:320—9.
[16] Baker J, Schorer J, Cobley S, Schimmer G, Wattie N. Circumstantial development and athletic excellence: the role of date of birth and birthplace. Eur J Sport Sci 2009;9:329—39.
[17] Schorer J, Backer J, Büsch D, Wilhelm A, Pabst J. Relative age, talent identification and youth skill development: do relatively younger athletes have superior technical skills? Talent Dev Excel 2009;1:45—56.