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Original Article

Exploring the relative age effect in Spanish beach volleyball players

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Abstract:
The relative age effect (RAE) is extensively investigated in sports. In general, it is believed that individuals who are born in the early months (e.g., January, February) have an advantage in competitions that divide the categories by the year of birth. However, this has not yet been investigated in beach volleyball, as well as the effect on athletes' role. Therefore, the aim of this study is to explore the influence of RAE in different age-groups categories and player roles within the Spanish beach volleyball context. Male and female players were classified and analyzed in terms of the population (athletes registered with a sport license at National Federation n=841), and the sample (athletes who participated in the 2016 National Championships in U14, U16, U19 and U21 categories -n=260-). The variables employed were the year, semester, quarter and trimester of birth, and the player role (blocker, defender or universal). In terms of population, a RAE was only observed in U19 male players with a lower proportion of athletes born in the last trimester of the year, and in the U16 female category with a higher proportion of athletes born in the second trimester of the year. Concerning the sample, a RAE was found in U14 female players born in the last year of the category (older players). In terms of the player role, a RAE was only found regarding male blockers. These findings indicate a short presence of RAE in the Spanish beach volleyball context, being not always related to the starting categories. These results can be taken into account by coaches and federations in order to create proper environments (competition rules) related to players' characteristics, avoiding a standing out of players that could only be supported by the maturity process.
Key Words: team sports, talent development, maturity, age, player role..

Introduction

The sport performance emerges as an adaptive and dynamic behavior from a mixture combination between the context (rules, opponent features, etc.) and individual characteristics (anthropometric, physical capabilities, technical-tactical level, and psychological state (Glazier, 2010). Concerning the latter, players are strongly influenced by their maturity process, affecting mainly the development of anthropometric and physical attributes at the initial stages. Therefore, players in an early mature state show a higher motor performance compared to their counterparts (Malina et al., 2004). Sporting event organizers commonly use age in order to create supposedly balanced sub-groups (e.g. experience, physical development, etc.). In beach volleyball, this division is made considering two or three years for each category.

The maturity process is specific for any individual, and two players with the same chronological age (date of birth) may have a different biological age (maturity state) (Jones et al., 2000; Malina et al., 2004). However, there is a wide proportion of older and mature players, especially in initial age-group categories (Carling et al., 2009; Gil et al., 2007). This phenomenon is labeled as "Relative Age Effect" (RAE) and indicates how players born in the early months of the year have an advantage over those born in the last months of the year based on the increasing probability of being in an advanced mature state (Barnsley et al., 1992). This performance advantage is more evident in initial categories precisely because the cut-off age date is used to split the championships' categories (e.g., U14, U16, and others), and it is explained based on the association between maturation, anthropometric and physical variables. In this sense, male handball players born in the first semester were taller than ones born later (Camacho-Cardenosa et al., 2018); youth soccer players closer to the growth peak high velocity were faster in sprint and agility test (Gil et al., 2014), while the 70% of basketball finalists of a National Spanish Tournament born in the first trimester (Torres-Unda et al., 2016). Moreover, in the women volleyball World Championship (U18), the top countries had a higher frequency of players born at the beginning of the year (Campos et al., 2020).

In volleyball, some studies have dealt with the influences of RAE on male (Parma & Penna, 2018; Solon Junior & Silva Neto, 2020) and female players (Okazaki et al., 2011; Papadopoulou et al., 2019), but not in beach volleyball in terms of the gender. The relevance of anthropometric factors is crucial in the initial stages (Gabbett & Georgieff, 2007), especially in serve, reception, attack, and block (Stamm et al., 2005). Nevertheless, anthropometric features vary in terms of players' roles due to the game requirement differences (Duncan et al., 2006). The beach volleyball characteristics (i.e., explosive and quick actions) can precisely favor athletes with

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the most advanced development (Gantois et al., 2017). Moreover, the presence of only two players, normally differentiated between blocker and defender (Costa et al., 2021) may emphasize the anthropometric differences and importance of RAE in this sport. Thus, we hypothesize that RAE could be arising in beach volleyball, both in male and female practitioners but especially related to the blocker role. Previously, although relative age was not associated with playing position in football (Figueiredo et al., 2022), the RAE could be more pronounced for some positions with high physical and anthropometric requirements (Karcher & Buchheit, 2014). In this since, blockers are usually taller than defenders (Palao et al., 2008), as it facilitates this action during the match. Thus it is expected that a higher proportion of athletes born in the initial months will be addressed to assume this role, especially in early maturity development athletes.

Nowadays, the beach volleyball competition structures are designed based on the date of birth, so the relevance of RAE remains important, especially in sports where the anthropometric features are relevant. Moreover, no studies have been found about the influence of RAE on beach volleyball. Thus, this study aimed to explore the influence of relative age effect in different age-group categories and player roles within the Spanish beach volleyball context. The main findings may be helpful to evaluate better ways of dividing categories, being useful for coaches to avoid the selection of players based on anthropometric characteristics derived from an advanced maturity status, and more importantly, to avoid mistakes that lead latter-maturity players to drop-out sport.

Material & methods

Sample

The date of birth of all beach volleyball players registered in the *Real Federación Española de Voleibol* (n=841) during the 2016 season was collected. Moreover, the date of birth and player role of all participants in the Spanish Beach Volleyball Championships (n=260) during the same season was also analyzed. These players were classified into under-14, under-16, under-19, and under-21 age-groups categories in terms of their year born (Table 1).

Table 1. Population, sample and sample representativeness in different age-groups.

		U14		U16		U19		U21		Total
		n	%	n	%	n	%	n	%	
Population	Male	100	36.23	106	37.32	86	49.14	53	50	345
	Female	176	63.77	178	62.68	89	50.86	53	50	496
	Total	276	100	284	100	175	100	106	100	841
Sample (C.S. 2015)	Male	47	41.59	N/D	N/D	38	50.67	36	50	121
	Female	66	58.41	N/D	N/D	37	49.33	36	50	139
	Total	113	100	N/D	N/D	75	100	72	100	260
Representativeness	Male	47%		N/D		44.19%		67.92%		35.07%
	Female	37.50%		N/D		41.57%		67.92%		28.02%
	Total	40.94%		N/D		42.86%		67.92%		30.92%

Note. C.S.: Spanish Championship; N/D: no data available.

Variables

The variables analysed was collected by questionnaire, and were in relation to age-group, gender, born period, and player role (see Table 2 for more details).

Table 2. Description study's variables.

Variable	***Description***
Age-group	*under 14: players with a maximum of 14 years* *under 16: players with a maximum of 16 years* *under 19: players with a maximum of 19 years* *under 21: players with a maximum of 21 years*
Gender	*Male or female*
Born period	*born year: player born in the last (older) or in the subsequent years into the age-group category* *born semester: player born in the first (from January to June -S1-) or second (from July to December -S2-) period of the year into the age-group category* *born quarter: player born in the first (from January to April -Q1-), second (from May to August -Q2-) or third (from September to December -Q3-) part of the year into the age-group category* *born trimester: player born in the first (from January to March -T1-), second (from April to Jun -T2-), third (from July to September -T3-) or fourth (from October to December -T4-) part of the year into the age-group category*
Player role	*blocker: player who perform in block in the defensive phase* *digger: player who perform in defense in the defensive phase* *universal: player who perform in block or defense alternatively*

Procedure

The principal researcher required authorization from the national federation that organized the championships. Also, the coaches of any team let the questionnaire be administered to the players. Hence, dates of birth were obtained from the federative organism and the participants. Players voluntarily accept the questionnaire compliments without knowledge of the research aims. The data were registered in a common

spreadsheet. The 20% of the questionnaire was reviewed to assess good reliability (ICC = 0.99).

Statistical analysis

Firstly, a descriptive analysis was done. Then, a Chi-Square test ($p < .05$) was performed to compare the proportion of players in any variables and categories. Furthermore, the effect size was calculated in terms of Crammer's V, with values of 0.1, 0.3, and 0.5 for small, medium, or large effects, respectively. Data were analysed with SPSS v.23. software (Statistical Package for the Social Sciences, SPSS Inc).

Resuts

Relative age effect and competition categories

The Table 3 shows the data related to all the players registered in the federation and the players that took part in the sample. From the former, a statistically significant association was found in the U19 male category (z =-2.2, p <.05), showing a lower number of players born in the last trimester of the year. Contrarily, a higher proportion of players was found in the U21 male category in the same period (z =2.2, p <.05). In the female category, a statistically significant association was found in the year of birth (z =3.5, p <.001) at U19, showing a prevalence of "younger" players who were not born in the last year for this category. Moreover, in female U16 there was a prevalence of players born in the second trimester of the year (z =2.3, p <.05). Going to the study's participants, there was a statistically significant association between female players and the born year. In this sense, there was a prevalence of "older" players born in the first year of competition in U14 (z =4.8, p <.001), and a prevalence of players born in subsequent years in U19 (z =2.8, p <.01) and U21 (z =2.7, p <.01). All the associations showed a large effect (*Cramer's V* > 0.51). No statistically significant associations were found in males.

Table 3. Relative age effect in male and female beach volleyball players according to different age-group categories.

		U14	U16	U19	U21	U14	U19	U21
Male								
LY	*n (%)*	52 (52%)	58 (54.72%)	41 (47.67%)	23 (43.40%)	24 (51.06%)	16 (42.11%)	11 (30.56%)
SY	*n (%)*	48 (48%)	48 (45.28%)	45 (52.33%)	30 (56.60%)	23 (48.94%)	22 (57.89%)	25 (69.44%)
S1	*n (%)*	60 (60%)	57 (53.77%)	54 (62.79%)	28 (52.83%)	25 (53.19%)	23 (60.53%)	22 (61.11%)
S2	*n (%)*	40 (40%)	49 (46.23%)	32 (37.21%)	25 (47.17%)	22 (46.81%)	15 (39.47%)	14 (38.89%)
Q1	*n (%)*	42 (42%)	45 (42.45%)	42 (48.84%)	20 (37.74%)	16 (34.04%)	16 (42.11%)	15 (41.67%)
Q2	*n (%)*	34 (34%)	26 (24.53%)	28 (32.56%)	15 (28.30%)	14 (29.79%)	12 (31.58%)	12 (33.33%)
Q3	*n (%)*	24 (24%)	35 (33.02%)	16 (18.60%)	18 (33.96%)	17 (36.17%)	10 (26.32%)	9 (25.00%)
T1	*n (%)*	32 (32%)	39 (36.79%)	34 (39.53%)	14 (26.42%)	11 (23.40%)	14 (36.84%)	10 (27.78%)
T2	*n (%)*	28 (28%)	18 (16.98%)	20 (23.26%)	14 (26.42%)	14 (29.79%)	9 (23.68%)	12 (33.33%)
T3	*n (%)*	20 (20%)	22 (20.75%)	20 (23.26%)	7 (13.21%)	9 (19.15%)	6 (15.79%)	6 (16.67%)
T4	*n (%)*	20 (20%)	27 (25.47%)	12* (13.95%)	18* (33.96%)	13 (27.66%)	9 (23.68%)	8 (22.22%)
Female								
LY	*n (%)*	104 (59.09%)	104 (58.43%)	34 (38.20%)	30 (56.60%)	47 (71.21%)*	11 (29.73%)	11 (30.56%)
SY	*n (%)*	72 (40.91%)	74 (41.57%)	55 (61.80%)*	23 (43.40%)	19 (28.79%)*	26 (70.27%)*	25 (69.44%)*
S1	*n (%)*	102 (57.95%)	109 (61.24%)	47 (52.81%)	28 (52.83%)	39 (59.09%)	22 (59.46%)	19 (52.78%)
S2	*n (%)*	74 (42.05%)	69 (38.76%)	42 (47.19%)	25 (47.17%)	27 (40.91%)	15 (40.54%)	17 (47.22%)
Q1	*n (%)*	73 (41.48%)	69 (38.76%)	35 (39.33%)	20 (37.74%)	29 (43.94%)	13 (35.14%)	14 (38.89%)
Q2	*n (%)*	56 (31.82%)	59 (33.15%)	27 (30.34%)	13 (24.53%)	19 (28.79%)	15 (40.54%)	11 (30.56%)
Q3	*n (%)*	47 (26.70%)	50 (28.09%)	27 (30.34%)	20 (37.74%)	18 (27.27%)	9 (24.32%)	11 (30.56%)
T1	*n (%)*	60 (34.09%)	51 (28.65%)	27 (30.34%)	16 (30.19%)	22 (33.33%)	9 (24.32%)	11 (30.56%)
T2	*n (%)*	42 (23.86%)	58 (32.58%)*	20 (22.47%)	12 (22.64%)	17 (25.76%)	13 (35.14%)	8 (22.22%)
T3	*n (%)*	43 (24.43%)	36 (20.22%)	23 (25.84%)	10 (18.87%)	17 (25.76%)	10 (27.03%)	8 (22.22%)
T4	*n (%)*	31 (17.61%)	33 (18.54%)	19 (21.35%)	15 (28.30%)	10 (15.15%)	5 (13.51%)	9 (25%)

Notes. LY: last year; SY: subsequent years; S1: 1st semester; S2: 2nd semester; Q1: 1st quadrimester; Q2: 2nd quadrimester; Q3: 3rd quadrimester; T1: 1st trimester; T2: 2nd trimester; T3: 3rd trimester; T4: 4th trimester; *statistically significant association (X^2 > 1.96).

Relative age effect and player role

Table 4 shows the data related to RAE according to the player role. There was only found a statistically significant association between the player role (blocker) and the trimester born in the male category, showing a significant prevalence of blocker players in the first trimester of the year ($z = 2.0$, $p < .05$). In the female category, there was a significant prevalence of blockers born in subsequent years ($z = 2.2$, $p < .05$), of universal players born in the first year of competition ($z = 2.4$, $p < .05$), and a significant decrease of universal players born in the second quarter of the year ($z = -2.1$, $p < .05$). All the associations showed a medium effect (Cramer's V between 0.32 to 0.47).

Table 4. Relative age effect in male and female beach volleyball players according to player role.

		Blocker	Digger	Universal	Total
Male	Last year	12 (23,53%)	12 (23,53%)	27 (52,94%)	51
	Subsequent years	18 (25,71%)	24 (34,29%)	28 (40,00%)	70
	1st semester	18 (25,71%)	23 (32,86%)	29 (41,43%)	70
	2nd semester	12 (23,53%)	13 (25,49%)	26 (50,98%)	51
	1st quarter	14 (29,79%)	13 (27,66%)	20 (42,55%)	47
	2nd quarter	9 (23,68%)	13 (34,21%)	16 (42,11%)	38
	3rd quarter	7 (19,44%)	10 (27,78%)	19 (52,78%)	36
	1st trimester	13 (37,14%)*	10 (28,57%)	12 (34,29%)	35
	2nd trimester	5 (14,29%)	13 (37,14%)	17 (48,57%)	35
	3rd trimester	5 (23,81%)	5 (23,81%)	11 (52,38%)	21
	4th trimester	7 (23,33%)	8 (26,67%)	15 (50,00%)	30
Female	Last year	5 (7,25%)	15 (21,74%)	49 (71,01%)*	69
	Subsequent years	14 (20,00%)*	20 (28,57%)	36 (51,43%)	70
	1st semester	13 (16,25%)	18 (22,50%)	49 (61,25%)	80
	2nd semester	6 (10,17%)	17 (28,81%)	36 (61,02%)	59
	1st quarter	9 (16,07%)	11 (19,64%)	36 (64,29%)	56
	2nd quarter	9 (20,00%)	14 (31,11%)	22 (48,89%)*	45
	3rd quarter	1 (2,63%)	10 (26,32%)	27 (71,05%)	38
	1st trimester	8 (19,05%)	7 (16,67%)	27 (64,29%)	42
	2nd trimester	5 (13,16%)	11 (28,95%)	22 (57,89%)	38
	3rd trimester	5 (14,29%)	9 (25,71%)	21 (60,00%)	35
	4th trimester	1 (4,17%)	8 (33,33%)	15 (62,50%)	24

Discussion

This study aimed to explore the influence of relative age effect in different age-group categories and player roles within the Spanish beach volleyball context. In brief, the hypothesis related to a relative age effect in initial categories should be partially accepted, also in the player role analysis. Overall, a RAE is only found in the U14 female category in terms of the age of birth, meanwhile, there is a higher percentage of blockers born in the first trimester of the year in the male category.

Concerning the appearance of RAE, the existence of this phenomenon only in the first age group and in the female category supports the importance of the maturity process that is commonly earlier in female athletes (Côté et al., 2006). However, many studies have found a RAE in senior categories (Mujika et al., 2009) or older (post-mature) age groups such as U19 and U21 handball (Wrang et al., 2018) and U18 and U20 basketball players (Kalén et al., 2021). These differences could be related to the type of sports and the relevance of the different performance factors (anthropometric, physical, technical, tactical, or psychological), as well as the sample selected. Thus, beach volleyball is a non-contact and highly unpredictable sport, so technical-tactical skills may prevail in the younger categories (van Rossum, 2006), and the maturation does not influence technical and tactical capabilities (Coelho and Silva et al., 2008). This rationale could explain the scarce RAE found in this study.

Regarding the player role, the higher percentage of male blocker players born in the first trimester of the year could be associated with a higher maturity process that influences anthropometric development that is associated with the blocker game demands. The block performance is related to height and reach (Stamm et al., 2005), and these anthropometric factors are strongly related to the maturity process (Coelho and Silva et al., 2008). In beach volleyball, there are only two players on a team. Hence, the anthropometric criterion helped by maturity could be linked to taller players participating as blockers. Similarly, basketball players born earlier in the year were also taller (Camacho-Cardenosa et al., 2018). Thus, the hypothesis of this study related to the player role is partially confirmed but only in the male. The female category showed a higher percentage of

universal players that does not confirm a RAE in terms of the player role. Moreover, the differences in game patterns and the anthropometric differences between players of the same team can explain these findings.

The consequences of RAE are mainly connected to the player inclusion in talent and development programs, so players that were born later and show a minor maturity status (Barnsley et al., 1992), and commonly associated with a dropout (Helsen et al., 2000). Furthermore, mature players have more opportunities for training in advanced learning contexts (good coaches and athletes), and working with others at higher performance levels (Müller et al., 2017). In this sense, only 6% and 11% of players selected, male and female respectively, were born at the end of the year in the selection process of the Polish national volleyball development program (Rubajczyk & Rokita, 2020). For this reason, nowadays, many studies are focusing on different sports organizations in youth categories, mainly based on players' maturation state and creating a bio-banding framework to facilitate player development (Cumming et al., 2017). In this sense, coaches must carefully suggest the role that athletes should assume, or even the universal model is the most suitable for initial categories. This is because taller athletes may have just matured more quickly (Gil et al., 2014), and the height differences may not exist in advanced categories. Therefore, having experience in the blocker and defender role can help to a better adaptation in future game situations. These suggestions are coherent with the avoidance of selecting players with an advanced maturity state. Furthermore, sports performance derived from a more complex measure than anthropometric characteristics.

Despite this study being, to the best of our knowledge, the first one investigating the RAE in beach volleyball, some limitations must be considered. Thus, no information about the relationship between RAE and performance was collected. In this sense, anthropometric measurement, physical tests, and maturational indicators such as peak height velocity should be considered in the future. A previous study concluded that the combination of physical, physiological, maturational, and age aspects are crucial for basketball performance (Torres-Unda et al., 2016). On the other hand, the sample size was quite representative, which would make it difficult to make other measurements about players' performances.

Conclusions

The analysis of the Spanish beach volleyball context shows a relative age effect in U14 female players concerning the year of birth. Thus, a prevalence of older players was found, although this effect disappears in the next categories because of a higher proportion of players born in the subsequent years. For the player role, only the male blockers are associated with players born in the first period of the year. As it can be elucidated, there is a reduced presence of RAE in the Spanish Beach Volleyball championships analyzed, and the main effects are found only at initial categories, when the maturity process has a strong influence. In addition, it is necessary in the future investigate the association with success in championships. Furthermore, coaches should be cautious in assigning the role of blocker considering only the athlete's current conditions, since a possible anthropometric superiority may be involved in an early maturational development. An alternative is to allow the athlete to also experience the role of defender in training. These results can be considered by coaches and federations to create proper environments (competition rules) related to players' characteristics, avoiding standing out of players that could only be supported by the maturity process.

Conflicts of interest - The authors declare no conflict of interest.

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