Díaz-Aroca, A. y Arias-Estero, J.L. (2022) Relative Age Effect In U12 Spanish Basketball: The Past Decade Analysis. Revista Internacional de Medicina y Ciencias de la Actividad Física y el Deporte vol. 22 (86) pp. 243-254 Http://cdeporte.rediris.es/revista/revista86/artedad1339.htm
DOI: https://doi.org/10.15366/rimcafd2022.86.003

ORIGINAL

RELATIVE AGE EFFECT IN U12 SPANISH BASKETBALL: THE PAST DECADE ANALYSIS

EDAD RELATIVA EN BALONCESTO U12 ESPAÑOL: ANÁLISIS DE LA ÚLTIMA DÉCADA

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ACKNOWLEDGEMENTS

During the preparation of this manuscript, the first author was supported through the UCAM Research Vice-Rector's Plan - Predoctoral Contracts Subprogram for the Training of Research Staff.

UNESCO code / Código UNESCO: 5899 Other pedagogical specialties (Physical Education and Sports) / Otras especialidades pedagógicas (Educación Física y Deporte)
Council of Europe classification / Clasificación del Consejo de Europa: 4 Physical Education & sport compared / Educación Física y deporte comparado

Recibido 8 de febrero de 2020 **Received** February 8, 2020
Aceptado 19 de abril de 2020 **Accepted** April 19, 2020

ABSTRACT

The objectives of this study were: (a) to analyze the relative age effect (RAE) in the players participating in the Spanish Championship of Minibasket during the last decade, and (b) to determine a possible relationship between RAE and the final classification of the analyzed teams. All players (n = 2268) from the 19 participating teams during the years 2009-2018 were analyzed. We subdivided the players according to their date of birth into four quartiles and grouped the top 10 teams of the ranking into three different categories. The results showed RAE during the past decade ($\chi 2$ = 380.57, P = .000). In addition, the top three teams included a greater number of players born in the first half of the year (83.40%, $\chi 2$ = 183.15, P = .000). In conclusion, RAE could affect the U12-basketball performance.

KEY WORDS: RAE, youth sport, talent selection, athletic development, mini-basketball.

RESUMEN

Los objetivos de este estudio fueron: (a) analizar el efecto de la edad relativa (RAE) en los jugadores que participaron en el Campeonato de España de Minibásquet durante la última década, y (b) determinar una posible relación entre RAE y la clasificación final de los equipos analizados. Los participantes analizados fueron todos los jugadores (n = 2268) de los 19 equipos participantes durante los años 2009-2018. Se dividió a los jugadores, según su fecha de nacimiento, en cuatro cuartiles y se agruparon a los 10 mejores equipos de la clasificación en tres categorías diferentes. Los resultados mostraron el RAE durante la última década ($\chi 2$ = 380.57, P = .000). Los tres mejores equipos incluyeron un mayor número de jugadores nacidos en la primera mitad del año (83.40%, $\chi 2$ = 183.15, P = .000). En conclusión, el rendimiento en baloncesto U12 podría verse afectado por el RAE.

PALABRAS CLAVE: RAE, iniciación deportiva, identificación de talentos, desarrollo deportivo, minibásquet.

INTRODUCTION

The relative age effect (RAE) in basketball has been widely studied because basketball is one of the most extensively practiced team sports worldwide (DiFiori et al., 2018). This can lead to large maturation differences among players born in the same year (Malina, Bouchard, & Bar-Or, 2004; Ramos, Volossovitch, Ferreira, Fragoso, & Massuça, 2019). Consequently, RAE can condition the players' performance mainly due to the development of their physical capacities (Malina, 1994; Musch & Grondin, 2001). However, RAE is more evident in children's sport than in adult sport because there are great morphological differences between the players in youth sport (Malina et al., 2004). As category increases, RAE decreases (Saavedra, Gutiérrez, Fernández, Fernández, & Eiras, 2012; Schorer, Cobley, Büsch, Bräutigam, & Baker, 2009). Many of the talented youth players will never be professional players (Feu, Ibáñez, Sáenz-López, & Giménez, 2008; Ibáñez, Sáenz-López, Feu, Giménez, & García, 2010; Sáenz-López, Feu, & Ibáñez, 2006). Nevertheless, there are very few studies that analyze RAE in youth basketball (e.g., Delorme & Raspaud, 2009; Delorme, Chalabaev, & Raspaud, 2011) and none just in U12 basketball.

In basketball, several studies showed the relation between RAE and different variables, like the playing position in U14 to U21 basketball due to the specific physical requirements of each position (Arrieta, Torres-Unda, Gil, & Irazusta, 2015; Ibáñez et al., 2018; Saavedra et al., 2012; Te Wierike, Elferink-Gemser, Tromp, Vaeyens, & Visscher, 2015). On the other hand, the month of birth, body height, and sex were determinants in the final classification in U14 to U22

basketball (Rubajczyk, Świerzko, & Rokita., 2017). Likewise, individual players' performance was analyzed by Arrieta et al. (2015), finding that relatively older U16 and U20 male players obtained a higher average of total points when the results were normalized to the time played. Regarding the anthropometric characteristics, Torres-Unda et al. (2013) discovered that a greater number of "elite" U14 players were born in the first half of the year and were taller, heavier, and had a greater arm span and hand length. In addition, better performing players were more mature than their peers (Torres-Unda et al., 2016).

In this regard, Sáenz-López et al. (2006) analyzed the players' progression of those that had a better performance in the youth basketball national team. They did not find that the best basketball players of the national team had been playing as youth in the previous categories of the national team. In this sense, Feu et al. (2008) evaluated the female basketball players' progression who belonging to the national team throughout the discrete categories of the national team. Similar to the former study, the top players in youth basketball were not players of the national team as adults. Finally, Ibáñez et al. (2010) ratified these previous results because only a small percentage of talented youth players (22.2%) reached a high level of performance when they were adult. Hence, an early participation in the youth basketball national team does not always guarantee the development of their talent.

To date, there are only two studies that verified the influence of RAE in U12 basketball, but including players from categories between U7 and U17. Delorme and Raspaud (2009) found the presence of RAE in all the youth categories of the French Basketball Federation. Later, they also observed that RAE may have significantly influenced sports dropout (Delorme et al., 2011). However, no studies have been found to determine this effect in Spanish U12 players. This study is relevant because Spain represents one of the world powers in basketball. The objectives of this study were: (a) to analyze the RAE in the U12 players participating in the Spanish Mini-basketball Championship during the last decade, and (b) to determine a possible relationship between RAE and the final classification of the analyzed teams. The hypothesis was that the selection of players would be affected by RAE and, in addition, there would be a relation with the final classification of the teams.

MATERIAL AND METHODS

Participants

All the male players (n = 2268) from the 19 participating teams in the Spanish Mini- basketball Championships (11 and 12 years of age) were analyzed during the years 2009-2018 (Table 1). The birthday of all the players were obtained from the official website of the Spanish Basketball Federation (http://www.feb.es/campeonatos.aspx). This website showed the information relative to each player day, month and year of birth. Overall, the teams were organized in four groups according to their classification in the last championship. Within each group, all the teams were matched against each other one time. Later, the teams were matched with those of the other groups. The arena and dates of the games were always the same. As the data analyzed

were of public domain, it was not necessary to obtain the approval of the Ethics Committee in Research of the University.

Design

The study followed a descriptive and longitudinal design (Montero & León, 2007). The criteria analyzed were the quartile relative to players' birthday and team classification for each year. This information was registered since 2009 to 2018.

Procedure

Data collected were reliable according to Spanish Basketball Federation procedures. From this information, the year of birth of the players was subdivided into four quartiles (e.g., Delorme et al., 2011; Werneck et al., 2016). Those born between January and March were the first quartile (Q1); those born between April and June were the second quartile (Q2); those born between July and September were the third quartile (Q3); and those born between October and December were the fourth quartile (Q4). The 161 first-year players were classified as Q4.

We grouped the top 10 teams of the ranking during the past decade into three different categories (e.g., Rubajczyk et al., 2017). The "Top 3" were the first three teams classified; "4-8 position" were those classified between the fourth and eighth positions; "9-10 position" were those classified in last position.

Table 1. Number of participations, number of top 10 ranking, the best and the worst classifications of the teams analysed during the last decade

Team	*Number of Participations*	*Number of Top 10 Ranking*	*Best Ranking*	*Worst Ranking*
Community of Madrid	10	10	1	6
Canary islands	10	10	1	5
Andalusia	10	10	1	5
Catalonia	10	10	1	4
Valencian Community	10	9	3	11
Balearic	10	9	3	11
Aragon	10	8	5	11
Basque Country	9	7	4	14
Castilla and Leon	10	7	6	12
Castilla La Mancha	10	6	5	17
Galicia	10	5	6	17
Cantabria	10	4	8	14
Region of Murcia	10	3	10	15
Navarre	10	1	10	17
Extremadura	10	1	9	16
La Rioja	10	0	13	18
Asturias	10	0	12	17
Melilla	10	0	16	18
Ceuta	10	0	17	19

Data analysis

Statistical analysis of the quantitative data was conducted using SPSS v. 22.0. We used the Chi-square test ($\chi 2$) to analyze the relation of RAE with each quartile of the year and with the final ranking. Cramer's V measure was used to measure the degree of association between variables. Further, the meaning of the associations was explored using adjusted standardized residual (ASR). Statistical significance was set at $P < .05$.

RESULTS

Overall, the results showed the influence of RAE during the past decade ($\chi^2 = 380.57$, $P = .000$, $V = .24$). In addition, this effect was repeated each year (Table 2). The results were practically ratified because of the high *ASR* values regarding the first quartile. This meant that a higher percentage of players participating in the Spanish Mini- basketball Championship (U12) were born in the first quarter of the year.

Table 2. Counts, percentages, adjusted standardized residual, chi-square, significant differences and Cramer's V of the relative age effect by quartiles in each season

Season	Quartile 1		Quartile 2		Quartile 3		Quartile 4					
	n (%)	*ASR*	*n* (%)	*ASR*	*n* (%)	*ASR*	*n* (%)	*ASR*	Total	χ^2	*P*	*V*
2009	98 (43.00)	13.22	62 (27.20)	1.27	41 (18.00)	-3.31	27 (11.80)	-5.05	228	50.21	.000	.27
2010	90 (39.50)	12.84	61 (26.80)	1.27	40 (17.50)	-4.40	37 (16.20)	-4.97	228	31.47	.000	.21
2011	93 (43.10)	13.40	56 (25.90)	.53	31 (14.40)	-4.55	36 (16.70)	-3.83	216	44.03	.000	.26
2012	81 (35.50)	12.24	59 (25.90)	.87	47 (20.60)	-3.89	41 (18.00)	-5.81	228	16.42	.001	.15
2013	92 (40.40)	11.51	70 (30.70)	3.73	35 (15.40)	-4.46	31 (13.60)	-4.96	228	44.80	.000	.26
2014	80 (35.10)	11.11	64 (28.10)	3.03	41 (18.00)	-5.53	43 (18.90)	-4.96	228	18.07	.000	.16
2015	92 (40.40)	12.50	64 (28.10)	2.08	38 (16.70)	-4.36	34 (14.90)	-5.00	228	37.96	.000	.24
2016	95 (41.70)	12.17	68 (29.80)	2.98	29 (12.70)	-4.94	36 (15.80)	-4.13	228	48.94	.000	.27
2017	95 (41.70)	11.11	75 (32.90)	4.67	28 (12.30)	-4.60	30 (13.20)	-4.43	228	58.56	.000	.29
2018	99 (43.40)	13.46	62 (27.20)	1.26	35 (15.40)	-4.19	32 (14.00)	-4.55	228	50.84	.000	.27
Total	915 (40.30)	39.20	641 (28.30)	6.98	365 (16.10)	-14.39	347 (15.30)	-15.28	2268	380.57	0.000	.24

The "Top 3" teams were made up of a greater number of players born in the first half of the year (83.40%, χ^2 = 183.15, *P* = .000, *V* = .36, Table 3). Furthermore, the teams that were located in the last position of the ranking had a higher percentage of players born in the last semester of the year (30.90%, χ^2 = 67.83, *P* = .000, *V* = .31) in comparison with the Top 3 teams (16.60%, χ^2 = 183.15, *P* = .000, *V* = .36, Table 3). Similar to the previous analysis, the results were practically ratified because of the high *ASR* values.

Table 3. Counts, percentages, adjusted standardized residual, chi-square, significant differences and and Cramer's V of the relation between relative age effect and ranking

Ranking	Quartile 1		Quartile 2		Quartile 3		Quartile 4					
	n (%)	*ASR*	*n* (%)	*ASR*	*n* (%)	*ASR*	*n* (%)	*ASR*	Total	χ^2	*P*	*V*
Top 3	181 (50.30)	16.54	119 (33.10)	4.27	39 (10.80)	-4.32	21 (5.80)	-4.26	360	183.15	.000	.36
4-8 position	278 (46.30)	22.06	170 (28.30)	2.69	90 (15.00)	-5.88	62 (10.30)	-7.16	600	187.52	.000	.32
9-10 position	114 (47.50)	15.69	52 (21.70)	-1.56	41 (17.10)	-3.30	33 (13.80)	-4.21	240	67.83	.000	.31

DISCUSSION

The objectives of this study were: (a) to analyze the RAE in the U12 players participating in the Spanish Mini-basketball Championship during the last decade, and (b) to determine a possible relationship between RAE and the final

classification of the analyzed teams. The results confirmed both hypotheses, as the selection of the players was affected by RAE, and there was relationship between RAE and the final classification of the teams. These results follow the trend found thus far that, in general, RAE is present in sports (Brustio et al., 2018; García et al., 2015; Romann, Rössler, Javet, & Faude, 2018). In addition, this effect was related to the classification of the teams according to the only study that did this analysis (Rubajczyk et al., 2017).

The results of this study coincided with those of previous youth basketball studies (Arrieta et al., 2015; García et al., 2015; Torres-Unda et al., 2013). The former studies proved that the selecting players were those who were predominantly born in the first months of the year. This effect was also found in other youth sports, like soccer (Brustio et al., 2018), athletics (Ortigosa-Márquez et al., 2018), swimming (Costa, Marques, Louro, Ferreira, & Marinho, 2013), and winter sports (Müller, Hildebrandt, Schnitzer, & Raschner, 2016). The explanation of this fact is that older players are selected because they are more developed physically, and they have an advantage over the rest of the players who compete in the same category (Musch & Grondin, 2001). As confirmed by Ramos et al. (2019), players born in the first semester were taller and heavier compared to those of the fourth semester.

There is a tendency in youth basketball to select players based on the advantages related to the date of birth (Feu et al., 2008; Ibáñez et al., 2010; Sáenz-López et al., 2006). However, Ibáñez et al. (2018) reported that such advantages are reduced or eliminated when players reach full maturation. In line, studies that analyzed this effect in basketball across different categories did not find any influence of RAE in the higher categories (García et al., 2015; Saavedra et al., 2012). Such lack of RAE in higher categories was justified because RAE was more evident in the selection of players in lower categories than in adults (Cobley, Baker, Wattie, & Mckenna, 2009; Schorer et al., 2009; Werneck et al., 2016). At early ages, the differences between the players' physical characteristics are much greater than in the senior categories. Nevertheless, Esteva et al. (2006) found this effect in professional basketball teams, because, in the lower categories, the players were selected according to their advanced maturation, associated with greater height and strength. For this reason, these players received higher quality training and had more opportunities to improve their basketball skills. Some authors insisted that early selection limits the possibilities of development as players because some of them simply mature late (García et al., 2015; Güllich et al., 2019; Waldron, DeFreese, Register-Mihalik, Pietrosimone, & Barczak, 2020).

The results of this work coincided with those obtained by Müller et al. (2016) and Rubajczyk et al. (2017), who found that RAE influenced sporting performance in competition. This could be due to the relationship between sporting success and athletes' physical capacities (Ramos et al., 2019). This relationship is more evident in sports where the performance can be determined by the participants' physical characteristics, such as body size and physical strength (Wattie, Cobley, & Baker, 2008). So that, there may be great maturation advantages in youth sport depending on the date of birth (Malina, 1994). However, coaches should be aware of the impact of the RAE on the

selection of players at an early age, be cautious and consider the future risks for younger players. Especially as some studies indicated that RAE was not a decisive factor to become a high performance basketball player (Werneck et al., 2016), or to be a professional player in other sports (Ford & Williams, 2011). For example, a promising athlete can be prematurely excluded as a result of coaches' preference for players who mature sooner, due to the urgency of achieving short-term results (Feu et al., 2008; Ibáñez et al., 2010; Sáenz-López et al., 2006). This can cause sport dropout of those who are not selected. The selected players received better quality training, a greater amount of practice and motivation, whereas those who were not selected were discouraged and less likely to develop their basketball skills (Werneck et al., 2016). In fact, the dropout rate of players born in the last two quartiles of the year was higher than that of those born in the first two quartiles (Delorme et al., 2011).

In relation with the previous idea, the results of the present work support the idea that youth basketball teams select the best players, in physical, technical and tactical terms, in order to win championships (Feu et al., 2008; Ibáñez et al., 2010; Sáenz-López et al., 2006). However, this fact could promote that many parents and coaches forget that youth basketball aims to develop children as a future adult players (Ibáñez et al., 2010). In this sense, both parents and coaches should emphasize game outcome as a result of working hard during trainings.

In general, RAE was present in the decade analyzed in the Spanish U12 teams and was related to their final ranking. This fact could mean that children were selected according to a higher maturation age. Consequently, children development as future basketball players could be negatively affected only looking for obtaining positive results immediately (Ibáñez et al., 2010). This happens when teaching-learning processes are designed forgetting that children enjoy and go further to be excellent players in the adult stage (Kliethermes et al., 2020). That is why coaches and stakeholders must seek strategies to minimize the differences due to maturation age. In this regard, it would be recommended that championships were organized base on children maturation development instead of their chronological age (bio-banding, Malina et al., 2019). This would help to prevent premature sport dropout and the possible loss of excellent senior basketball players (Güllich et al., 2019).

CONCLUSION

In conclusion, the present work is the first that studied RAE in Spanish U12 basketball players during the decade from 2009 to 2018. Using this research design, we found that a larger number of players who were born in the first half of the year participated. In addition, the best-ranked teams had more players born in the first half of the year. Therefore, the U12 basketball teams could improve their performance due to RAE.

In this sense, youth sport coaches and administrators must ensure the comprehensive training of young players in the long term. A possible strategy could be the development of complementary physical, technical, and tactical training programs that would compensate for the physical deficiencies of the

players born in the second half of the year. Furthermore, competition systems should be reviewed so victory will not prevail over other factors, such as achieving training objectives and fair play. The organization of championships according to the biological age could help to act logically in youth sports.

The present work main limitation is that players' anthropometric characteristics were not registered, as well as other physical measures, that could have strengthen the hypotheses showed throughout the discussion section. Hence, these hypotheses should be understood with caution and help researchers to promote future studies. Similarly, further studies should explore whether the players who participated in the Spanish U12 Championship continued to be selected in higher categories. This would be interesting in order to determine possible influences of maturation and skill developments.

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