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EVOLUTION OF THE RELATIVE AGE EFFECT IN SPANISH YOUNG FOOTBALLERS (U8 TO U19). A COMPARATIVE ANALYSIS IN ELITE CLUBS VS. LOW-LEVEL CLUBS

Alba Práxedes [1]; Fernando Del Villar [2]; Alexander Gil-Arias [2]; David Pizarro [1]; Alberto Moreno [3]

1. Faculty of Languages and Education, University of Nebrija, Spain.
2. Field Physical Education and Sport, Rey Juan Carlos University, Spain.
3. Faculty of Sport Sciences, University of Extremadura, Spain.

ABSTRACT

The purpose of this study was to identify the existence of Relative Age Effect (RAE) at youth football level in Elite and lower-level clubs in Spain. RAE was also analyzed within each age group of players (U8 to U19) and within each team category considering the sport expertise level (A, B, C and D teams), according to the kind of club. All players (n = 1862) belonged to eight Spanish football clubs and 114 teams. Birth dates were categorized into relative age quartiles. The results obtained by the square test revealed the existence of a RAE with a large effect in the Elite group, while in the lower-level group this effect was medium. Thus, results show significant differences in the Elite group in all age categories, whilst in the lower-level group these were only observed in the U14, U16 and U18 categories. With respect to the team category, while RAE was observed in the Elite group in all teams, in the lower-level group it was only observed in teams A and B. In conclusion, RAE is more pronounced in Elite clubs, even starting at the U8 category. However, in lower-level clubs, where the objective is not just performance, it is delayed.

Keywords: player selection, age categories, talent identification, elite and low-level clubs

EVOLUCIÓN DEL EFECTO DE LA EDAD RELATIVA EN JÓVENES JUGADORES DE FÚTBOL (SUB-8 A SUB-19). UN ANÁLISIS COMPARATIVO ENTRE CLUBES DE ELITE Y CLUBES DE NIVEL INFERIOR

RESUMEN

El propósito de este estudio fue identificar la existencia del Efecto de la Edad Relativa (EER) en el fútbol base en clubes de elite y clubes con un nivel inferior en España. El EER también fue analizado dentro de cada categoría federativa o grupo de edad (Sub-8 a Sub-19) y dentro de cada categoría de equipo teniendo en cuenta el nivel de experiencia deportiva (equipos A, B, C y D), de acuerdo con el tipo de club. Todos los jugadores (n = 1862) pertenecían a ocho clubes de fútbol españoles y 114 equipos. Las fechas de nacimiento se categorizaron en cuartiles. Los resultados obtenidos con la prueba de Chi-cuadrado revelaron la existencia de un EER de gran tamaño en el grupo Elite, mientras que en el grupo de nivel inferior este efecto fue medio. Además, los resultados muestran diferencias significativas en el grupo Elite en todas las categorías de edad, mientras que en el grupo de nivel inferior solo se observaron en las categorías Sub-14, Sub-16 y Sub-18. Con respecto a la categoría de equipo, mientras que el efecto se observó en el grupo Elite en todos los equipos, en el grupo de nivel inferior solo se observó en los equipos A y B. Como conclusión, el EER es más pronunciado en los clubes Elite, incluso comenzando en la categoría Sub-8. Sin embargo, en los clubes de nivel inferior, donde el objetivo no es solo el rendimiento, se retrasa.

Palabras clave: selección de jugadores, categorías de edad, identificación de talentos, élite y clubes de bajo nivel

Correspondence:
Alba Práxedes Pizarro apraxedes@nebrija.es
Faculty of Languages and Education, University of Nebrija, Spain.
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INTRODUCTION

The Relative Age Effect (RAE) in sport has been the subject of much research (for a review, see Musch & Grondin, 2001). It refers to "asymmetry in the birth date distribution favoring players born early in the selection year and discriminating against participants born later in the year" (Helsen et al., 2012). Thus, within a system using the first of January as a cutoff date, players born in January (relatively older) can have certain advantages, with respect to cognitive and physical development, over players born in December (relatively younger). Nevertheless, most of time, children and adolescents born during two consecutive years are gathered in a common category. Thus, a child born in January of the first year of a category will show a discrepancy of up to 23 months with a child born in December of the second year (Delorme, Boiché, & Raspaud, 2010).

RAE has been studied in different sports such as hockey (Nolan and Howell, 2010), rugby (Till et al., 2010), volleyball (Okazaki, Keller, Fontana, & Gallagher, 2011) and football (Sallaoui et al., 2014). In both professional and youth football, RAE has been a research topic since the early 1990s (Helsen et al., 2012). However, there are more studies in elite football (González-Víllora, Pastor-Vicedo & Cordente, 2015; Sedano, Vaeyens & Redondo, 2015) than studies that place emphasis on sports initiation and on the analysis of RAE through the different age categories, showing a RAE in favor of players born in the first quartile of the year (Delorme and Raspaud, 2008; Saavedra, Gutiérrez, Fernández, Fernández, & Eiras, 2014). In this regard, studies such as that by Lovell et al. (2015) point out that RAE exists in all categories, highlighting that this effect is already very big in the first ones (U8 and U10) and that this effect is disappearing.

On the other hand, RAE also describe the relationship observed between an individual´s month of birth relative to their peers and their achievement in sport (Cobley, Baker, Wattie, & McKenna, 2009). Delorme, Chalabaev and Raspaud (2011) and Philippaerts (2012) point out that players born later in the year (Q3 or Q4) who are selected are still more likely to drop out of academies or development pathways than relatively older players. In this regard, Martin, Clanton and Moon (2004) argued that the level of performance achieved by individuals depends on motivation. Thus, the accumulated effect of maturational disadvantages reduces the child´s self-esteem and leads to them become less involved in tasks and achieve worse results as a consequence (Hancock, Adler, & Côté, 2013). In this line, this occurs in a similar manner with the selection of players for the different team categories at each club. Gutiérrez, Pastor, González and Contreras (2010) analyzed the influence of this variable on RAE, finding no differences between team categories at each club. In this regard, noteworthy is the fact that those players selected for teams A and B

appear to have better capacities and more intrinsic (observed competence) and extrinsic motivation (appreciation of coaches and parents). This increased motivation, together with the perceived competence, encourages these children to practice more and further improve their skills (Helsen, Van Winckel, & Williams, 2005). Moreover, players who are in the best teams are usually trained by qualified and experienced professionals (Sherar, Baxter-Jones, Faulkner, & Russell, 2007), providing a performance advantage that may make the athlete eligible for even further support. This occurs in a similar manner between the most important clubs at national level (Elite clubs) and those that are less recognized (lower-level clubs), providing players who are selected by the first group with greater motivation levels. In this regard, there are few research studies in scientific literature that analyze RAE in elite clubs and lower-level clubs (Gutiérrez et al., 2010), finding the greater differences in the elite club group, in comparison with the lower-level group.

In this sense, the habit of selecting early maturing athletes for youth squads is inconsistent with modern principles of talent search and development programs (Unnithan, White, Georgiou, Iga, & Drust, 2012). Coaches should identify, in the early years of competition, young athletes with the potential to be elite performers as adults, and not the older athletes with physical maturity advantages (Till et al., 2010). The reason for this selection behavior is thought to be a preference for immediate performance success over the long-term goals of talent promotion (Augste & Lames, 2011).

We should point out that there is no literature about RAE in football that analyzes six age categories in different kinds of clubs, such as elite and lower-level clubs. Thus, the main purpose was to identify the existence of Relative Age Effect (RAE) according to the kind of club (Elite: clubs whose senior team is in the1st Division; lower-level: clubs whose senior team is in the 3rd Division) in Spain. The second aim was to analyze RAE within each age group of players (U8, U10, U12, U14, U16 and U19), and finally, to analyze RAE within each team category considering the sport expertise level (A, B, C and D teams). Information of this nature is necessary to further understand the influences upon the talent selection process in representative youth football.

METHOD

Participants

A total of 1862 football players in formative stages, with ages between six and 19 took part in the study. All players belonged to eight Spanish football clubs (football academies) and 114 teams (average of 16 players per team). The birth date distributions from all players in the 2015-2016 competitive season were examined.

The research has been developed under the recommendations of the Declaration of Helsinki and its project was fully approved by the Ethics Research Committee of the University.

Variables

The first variable was the kind of club. Thus, players were gathered into two groups. A first group, called Elite group, was made up of 4 clubs (n = 881) whose senior team was in the 1st Division. The second group, called lower-level group, was also made up of 4 clubs (n = 971) whose senior team was in the 3rd Division (they are characterized by players that are recruited from among soccer players from the actual town (i.e. it does not carry out a selection in which it would be able to capture players from the others cities such as the Elite group does).

The second variable was the age category. Thus, players were grouped into six age categories (U8, U10, U12, U14, U16 and U19). Youth competitions in Spanish soccer are thus made up of two-year categories, apart from the last one, in which players may remain for a maximum of three years.

The third variable was the team category considering the sport expertise level that was determined based on whether the players belonged to teams A, B or C, in each age category. The criterion used by lower-level soccer clubs in Spain was followed, i.e., the players were distributed according to their expertise level and experience in the particular category. Hence, the following classification of sport expertise level was used in this study:

1. High expertise level teams. *A Teams,* in each age category, consisted by players who have been selected with performance objectives, and with one year's experience in the category.
2. Intermediate expertise level teams. *B teams,* in each age category, consisted by players who have been selected with performance objectives, but without any experience in the category.
3. Low expertise level teams. *C teams,* in each age category, consisted by players who have not been selected among the best of their category, and whose participation in the club is recreation and education-oriented.

Moreover, teams A and B play in leagues more competitives.

Procedure

Player birth dates were attained from two different sources. The data pertaining to the Elite group was obtained from the official web sites of the clubs, and the sample from the lower-level group was obtained through direct approach. After that, player birth dates were categorized into four birth quartiles (Q) within a specific age category. Following the guidelines of the

Fédération Internationale de Football Association (FIFA), the national associations have used the 1st of January as the start date of the selection year since 1997. As such, the cut-off date for the soccer competition year is the 1st of January, and thus January is selected as the first month of the selection year and December as the last. Thus, Q1 players related to players born between January-March; Q2 = April-June; Q3 = July-September; and, Q4 = October-December.

Statistical Analyses

The asymmetry measures, kurtosis, Kolmogorov-Smirnov with Lilliefors correction, verified that the sample distribution did not follow a normal distribution, establishing the need to use non-parametric statistics. The Chi-square test was used to compare the relative age quartiles for each kind of the club, for each age group and for each team category at each club. Chi-square statistics did not reveal the magnitude and direction of an existing relationship. Significant chi-square values were, therefore, followed up by calculating Cohen´s effect sizes for quartile distribution, in order to examine subgroup differences based on the kind of the club, the age group and the team category at each club. Cohen´s effect sizes (*d*) were used to interpret as trivial (0-0.19), small (0.20-0.49), medium (0.50-0.79), and large (0.80 and greater) effects (González-Víllora et al., 2015). All the analyses were carried out using SPSS 19.0, and statistical significance was set at $p<0.05$.

RESULTS

Table 1 shows the distribution into quartiles of the birth dates of the players per group (Elite and lower-level). It should be noted that both groups showed a different distribution depending on the quartile in which players were born. The calculation of the effect size (d) reflected that there was RAE in the Elite group with a large effect and also in the lower-level group but with a small effect.

TABLE 1
Birth distribution and effect size of soccer players per Group of Clubs.

Clubs	Number and % of players per quartile					X2	P	Effect size (d)
	Q1 (%)	Q2 (%)	Q3 (%)	Q4 (%)	Total			
Elite	435 (48.8)	258 (29)	126 (14.1)	72 (8.1)	891	351.86	.000	1.63
Lower-level	291 (30)	246 (25.3)	229 (23.6)	205 (21.1)	971	16.28	.001	0.26

Table 2 shows the distribution in quartiles of the birth dates of the players per age group, in the Elite group. It should be noted that all categories showed a different distribution depending on the quartile in which players were born. Moreover, in all categories, the distribution of players was significantly different, being the percentage of players who were born in the first quartile being greater than the rest of quartiles. The calculation of the effect size shows a large effect in all categories. We can see how, as the age of the players increases, the RAE gradually decreases until U14, and then returns to lower levels at U19.

TABLE 2
Birth distribution and effect size of soccer players per Age Group in Elite Group.

Age Group	Number and % of players per quartile					X2	p	Effect size (d)
	Q1 (%)	Q2 (%)	Q3 (%)	Q4 (%)	Total			
U8	15 (57.7)	4 (15.4)	5 (19.2)	2 (7.7)	26	15.53	.001	2.43
U10	60 (57.7)	28 (26.9)	13 (12.5)	3 (2.9)	104	71.46	.000	2.96
U12	88 (45.1)	64 (32.8)	23 (11.8)	20 (10.3)	195	66.92	.000	1.44
U14	78 (45.1)	54 (31.2)	26 (15)	15 (8.7)	173	55.92	.000	1.38
U16	106 (57.6)	44 (23.9)	23 (12.5)	11 (6)	184	116.47	.000	2.62
U19	88 (42.1)	64 (30.6)	36 (17.2)	21 (19.1)	209	50.84	.000	1.13

Note. Q1-Q4 = birth quartiles 1-4; X^2 = Chi-square value; p = significance.

Table 3 shows the distribution in quartiles of the birth dates of the players per age category, in the lower-level group. It can be seen how all categories showed a different distribution depending on the quartile in which players were born. However, the distribution of players was only significantly different in age categories U14, U16 and U18. Furthermore, as the age of players increases, the effect size shows that the RAE gradually increases, too (that is, from 0.35 to 0.66).

TABLE 3
Birth distribution and effect size of soccer players per Age Group in Lower-Level Group.

Age Group	Number and % of players per quartile					X2	p	Effect size (d)
	Q1 (%)	Q2 (%)	Q3 (%)	Q4 (%)	Total			
U8	44 (28.8)	41 (26.8)	41 (26.8)	27(17.6)	153	4.56	.206	0.35
U10	52 (26)	54 (27)	49 (24.5)	45 (22.5)	200	0.92	.821	0.13
U12	56 (28)	50 (25)	41 (20.5)	53 (26.5)	200	2.52	.472	0.22
U14	51 (29.7)	36 (20.9)	54 (31.4)	31 (18)	172	8.79	.032	0.46
U16	46 (37.1)	27 (21.8)	24 (19.3)	27 (21.8)	124	9.87	.020	0.58
U19	42 (34.4)	38 (31.2)	20 (16.4)	22 (18)	122	12.16	.007	0.66

Note. Q1-Q4 = birth quartiles 1-4; X^2 = Chi-square value; p = significance.

Table 4 shows the distribution in quartiles of the birth dates of the players per team category, in the Elite group. It should be noted that all categories showed a different distribution depending on the quartile in which players were born. Moreover, the distribution of players was significantly different in all categories, the percentage of players who were born in Q1 being greater than the other. The calculation of the effect size shows a large effect in all categories.

TABLE 4
Birth distribution and effect size of soccer players per Team Category in Elite Group.

Team	Number and % of players per quartile					X2	p	Effect size (d)
	Q1 (%)	Q2 (%)	Q3 (%)	Q4 (%)	Total			
A	188 (47.4)	120 (30.2)	58 (14.6)	31 (7.8)	397	147.77	.000	1.54
B	187 (49.3)	110 (29)	50 (13.2)	32 (8.5)	379	154.96	.000	1.66
C	48 (53.3)	18 (20)	16 (17.8)	8 (8.9)	90	41.02	.000	1.83
D	12 (48)	10 (40)	2 (8)	1 (4)	25	14.84	.002	2.41

Note. Q1-Q4 = birth quartiles 1-4; X^2 = Chi-square value; p = significance

Table 5 shows the distribution in quartiles of the birth dates of the players per team category, in the lower-level group. It can be seen how teams A and B showed a different distribution and significant differences between the quartiles, the percentage of players who were born in the Q1 being greater than the other two. The effect size shows a small effect in these two teams. However, in C and D teams, this effect is not shown.

TABLE 5
Birth distribution and effect size of soccer players per Team Category in Lower-Level Group.

Team	Number and % of players per quartile					X2	p	Effect size (d)
	Q1 (%)	Q2 (%)	Q3 (%)	Q4 (%)	Total			
A	107 (33.2)	85 (26.4)	69 (21.4)	61 (18.9)	322	15.34	.002	0.44
B	107 (31.8)	86 (25.5)	79 (23.4)	65 (19.3)	337	10.90	.012	0.36
C	47 (26.6)	45 (25.4)	45 (25.4)	40 (22.6)	177	0.60	.895	0.11
D	30 (22.2)	30 (22.2)	36 (26.7)	39 (28.9)	135	1.80	.615	0.23

Note. Q1-Q4 = birth quartiles 1-4; X^2 = Chi-square value; p = significance

DISCUSSION

The main purpose of this study was to identify the existence of RAE in youth football at both Elite clubs (clubs whose senior team is in the1st Division) and lower-level clubs (clubs whose senior team is in the 3rd Division) in Spain. The main findings confirm the existence of a RAE in both groups, Elite and lower-level, with an overrepresentation of players born in the first and second quartiles of the year (relatively older players). Moreover, the effect size is greater in the Elite group than in the lower-level group. Once again, results confirm that the RAE is a persistent problem in male team sports (Delorme & Raspaud, 2008; Till et al., 2010), and this appears to be a global problem in male soccer (Cobley, Boiche, & Raspaud, 2008; Mujika et al., 2009). Thus, this evidence confirm that birth date can have an important influence on youth's sport participation (Turnnidge, Hancock, & Côté, 2014).

With respect to the differences found in our study between both types of clubs, it must be pointed out that in the Elite group, the RAE was much greater than in the lower-level group. In this regard, studies can be found in scientific literature that are along the same line as this one (Gutiérrez et al., 2010). These researchers observed that greater differences were found in the Elite group, indicating that the main cause of RAE in soccer might be attributed to the talent identification processes (Díaz Del Campo, Pastor-Vicedo, & González-Víllora, 2010). These findings could be foreseeable in the sense that these clubs (Elite) could carry out a selection that focuses more on older athletes, because they place more importance on short-term results than on long-term formation (Augste & Lames, 2011). However, in the lower-level group, this phenomenon is also observed. In this regard, Delorme et al. (2010) studied the relationship between dropouts and birth-month among French male footballers and found that in lower age categories, players who were born in the last quartile had a higher rate of dropouts. Therefore, coaches should be careful during player selection process in order to eliminate this unfair competition. In order to achieve this, a deep knowledge of youth development is considered necessary when selecting young footballers and forming teams.

The second objective of this study was to analyze the RAE within each age category (U8, U10, U12, U14, U16 and U19). Firstly, it is important to point out that the results observed differ depending on the type of club. Thus, in Elite clubs, RAE is observed in all categories, whilst in lower-level clubs only in the higher categories (from U14 up). More specifically, in the Elite group, our results showed that this effect is already very high in the first categories and only decreases very slightly as they get older. On the contrary, in the lower-level group as the age category increased, the RAE was more pronounced, and this phenomenon started to be observed from category U14 onwards.

The results obtained in the Elite group are consistent with other studies on football players (e.g. Lovell et al., 2015) where very high values are observed in the size of the effect from the first categories, finding a tendency to decrease until U18, similarly to what occurs in our study. In this line, González-Víllora et al. (2015) observed a higher effect in the U17 category in the different categories of the Eurocap, while in categories U19 and U21, this effect had an average magnitude. In this sense, these clubs seem to be very selective from very early ages, where physical differences are more obvious (Delorme & Raspaud, 2008; Saavedra et al., 2014).

However, in the lower-level group, RAE was not observed until the U14 category, and from there on a progressive increase is observed the older they become. These differences found with respect to the Elite group may be due to the fact that performance objectives do not start to prevail over formation objectives in these clubs until 14 years old, whilst in the Elite groups, the aim may be to obtain short-term performance from 6 years onwards. On the other hand, the fact that the RAE increases to a greater or lesser extent, and does not tend to decrease even though there is a tendency for these differences to even out in maturity, may be because these players, who are selected for category U14 and subsequent categories, have been chosen from the lower categories by the best teams of each category. This creates a cumulative effect of motivation (Helsen et al., 2005) and of experience (Díaz Del Campo et al., 2010).

The third objective of this study was to analyze the RAE within each team category at each age category (A, B, C and D teams). As occurs with the age category, different results are observed once again in both types of clubs. On the one hand, the results obtained in the Elite group confirm the existence of a RAE in all teams, with an overrepresentation of players born in the first and second quartiles of the year (relatively older players). On the other hand, in the lower-level group, the RAE can only be observed in the A and B teams.

These findings are congruent with previous research (e.g. Gutiérrez et al., 2010) in which it was found significant differences in all of the teams (A, B, D, etc.) with an overrepresentation of players born in the first and second quartiles of the year. It is important to highlight that it was an Elite club, that it is the same that occurs in our study, specifically in the Elite group. However, in the lower-level group, it was found differences between the four teams (A, B, C and D). One possible explanation to the differences found in our research between Elite and lower-level clubs may be that teams whose aim is to search for performance and teams whose aim is to promote sport are included in the lower-level clubs. As previous research suggest, RAEs may be moderated by competitive level and may strengthen as competitive level increases (Hancock, Young, & Ste-Marie, 2011).

On the other hand, and in general when applied to the players' selection process, it is worth pointing out that being selected for the best groups may have consequences. Firstly, it determines the possibility of playing in competitions and higher level tournaments, in more competitive leagues, (Helsen et al., 2005), which positively determines the player's development. And secondly, and as a result of the above, this creates an increase in the player's motivation (González-Víllora et al., 2015) which may result in the player having more confidence and making a greater effort. Thus, the player will have a better self-concept (Thompson, Barnsley, & Battle, 2004). Consequently, we have to point out that when considering RAE, emotional development should be taken into account too.

CONCLUSIONS

In conclusion, this study shows the presence of RAE in the current structure of Spanish male football. Moreover, RAE is more noticeable in Elite clubs, thus late maturing players have fewer opportunities of being selected for elite clubs. Likewise, these players have a greater likelihood of being selected for the best teams of each category (A and B). Taking into account these results, we recommend coaches and youth sport authorities to reflect upon these findings in order to avoid potentially counterproductive selection biases, which could mask unidentified intrinsic talent in relatively younger players. Various solutions have been proposed for this problem. Firstly, Glamser and Vincent (2004) point out the possibility of changing the structure of the competitive system and propose creating smaller age groups. As mentioned above, in Spain, each category is made up of two years. Thus then, modifying this structure from two years to one year per category could reduce this relative age effect. On the other hand, Kaiserman (2005) indicate the importance of separating players into categories based on their performance, with the aim of ensuring that players receive the same competitive opportunities. Thus, each player could gradually develop their sporting career, not depending on their age but on their sport learning level.

In order to do that, club managers and coaches should leave the importance of the result and reduce the pressure on players in the competition, giving priority to athlete training objectives (long-term objectives) over result achievement objectives (short-term objectives).

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