Original Article

Relative age effect in handball players of Spain

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Abstract:
This study analyzes the effect of relative age in the selection process of handball players for licensed club teams in the Murcia region and the Murcia Regional Handball teams. To this end we studied gender, date of birth and player category in a total of 846 handball players (762 of them in licensed clubs from the Murcia Regional Handball Federation, henceforth FBRM and 84 players in Murcia regional teams respectively) in the children's, junior and youth categories. Comparisons were made and differences were analyzed with χ2 and Z tests and the Bonferroni correction. The analysis of results according to quarter and semester of birth revealed statistically significant differences both for licensed clubs and for Murcia Regional handball team players. The gender and player category analysis showed statistically significant results only in the case of category in regional teams. Thus RAE is confirmed in the samples analyzed, this effect being stronger amongst regional team players.
Key words: relative age effect, handball, adolescence, maturity..

Introduction

The research related to a player's training process and talent spotting highlights that genetic predisposition for a particular sporting activity is not the only decisive factor and that players need to undergo a suitable long-term multidimensional training process which should be as age and level appropriate as possible (García, Cañadas & Parejo, 2007; Sáenz-López, Feu & Ibañez, 2006) so as to prevent early abandonment of potential sports talents (Abbott & Collins, 2004; Davids, Lees & Burzwitz, 2000; Williams & Reilly, 2000). Following Moreno (2004), handball players' progress will depend both on their initial talent level and on their work capacity throughout their training stages. In a previous study, Laguna & Torrescusa (2000) pointed out that high performance in handball is based on three elements: genetic factors such as raw material quality, plus two acquired factors: quantity and quality of work done and internalized. With regard to the variables which have traditionally defined the talent selection process, anthropometric characteristics (Carling, Le Gall, Reilly & Williams, 2009; Gorostiaga, Granados, Ibáñez & Izquierdo, 2005; Granados, Izquierdo, Ibáñez, Bonnabau & Gorostiaga, 2007) are worth highlighting as well as basic motor skills alongside anthropometric parameters (Srhoj, Rogulj, Zagorac, & Katic, 2006).

Success in high level handball requires a series of attributes such as strength, speed and aerobic capacity (Karcher & Buchheit, 2014) as well as mastery of technical and tactic aspects (Karcher, Ahmaidi, Buchheit, 2014). It is worth noting that the adoption of these criteria in the selection of players disfavors those who at a certain point in their training process do not have optimum biological development but do show potential to achieve good sports skills in the future (Hirose, Hirano & Fukubayashi, 2004). Added to all these issues affecting sports players' training processes, there is also the problem of relative age effect (RAE), which is caused by differences in chronological age in players in any particular category (Gómez-López, Granero-Gallegos, Feu & Chirosa, 2017; Prieto, Pastor, Serra & González, 2015). It is important to bear in mind that in most sports activities including handball, players are grouped in different categories according to year of birth in order to provide them with sports education according to their development level and to ensure equal opportunities in competition at all times (Burgess & Naughton, 2010; Musch & Grondin, 2001). Normally, the dividing line is drawn on January 1 each year so that all children born in the same calendar year are grouped together. However, age differences always exist and thus there are also potential differences in maturity, development and experience among players in the same category (Dixon, Horton & Weir, 2011; González, 2007). Maturity mainly affects anthropometric factors (Carling, la Gall, Reilly, & Williams, 2009), rather than technical or psychological aspects (Figueiredo, Gonçalves, Coelho e Silva, & Malina, 2009). Therefore, grouping young players according to age creates inequality in training (Lorenzo & Sampaio, 2005), a decisive

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factor in the selection process, especially in competitive sports and even more so in team sports like handball, in which the need to make the team conditions players. Therefore, this selection process is influenced by RAE especially at young ages (Cobley, Baker, Wattie & McKenna, 2009; Romann & Fuchslocher, 2011) such as adolescence (15-18 years), when physical differences are more patent. As a result of this, coaches who are performance oriented generally tend to complete their teams with physically mature players, which in turn means the majority of team players are born in the first months of the year (Lewis, Morgan, & Cooper, 2015; Okazaki, Keller, Fontana, & Gallagher, 2011).

All the above has consequences in players' training processes, positive in the case of selected players and negative for the others. Selected players will get more chances of taking part in more challenging training and competition contexts (French & McPherson, 1999; Gil, Ruiz, Irazusta, Gil, & Irazusta, 2007; Helsen, Starkes, & van Winckel, 1998). These players will be able to make the most representative club teams and even regional teams, which will in turn increase their chances of becoming professional players thanks to their access to better training conditions, expert coaches and a higher level of competition.

On the other hand, as players born in the last month of a year have to compete against more mature players, they tend to lose motivation and self-esteem (Jones, Hitchen, & Stratton, 2000) and when they fail to make a team, they usually abandon sports at early ages (Barnsley & Thompson, 1998; Delorme & Raspaud, 2009; Delorme, Chalabaev, & Raspaud, 2011; Helsen et al., 1998).

Studies such as Helsen et al. (2013), who carried out a study analyzing RAE in professional football players in ten European countries over a period of ten years, Saether (2015), who worked with a sample of young Norwegian footballers over a period of five years, and Saavedra, Gutiérrez, Galatti & Fernández (2015), who carried out an analysis of the FIBA Basketball World Cup between 1979 and 2011, showed the long term effect of RAE and proposed changes in the participation structure of young players with the aim of lowering the influence of RAE in the process of selection and talent spotting.

Building on all of the above and given the lack of studies in the handball field, the following objectives are proposed: first, to determine the existence and incidence of RAE in handball players in Handball Federation of the Region of Murcia (FBMRM) clubs and in players in the Murcia Regional teams in the 2015-2016 season. Second, to determine which of the two handball contexts analyzed (amateur and regional teams) is more affected by RAE, and third, to analyze the impact of RAE on gender and category (children, junior and youth) in both samples.

Material & Methods

Participants

We carried out a sectional, descriptive and non-experimental study. The sample included a total of 846 handball players, 84 of which (42 boys and 42 girls) played in the Murcia Regional children's, junior and youth teams in the latest Regional Teams Spanish Cup in January 2016, and 762 (469 boys and 293 girls) were FBMRM club players for the 2015/2016 season distributed in the following way: 292 children, 311 junior players and 159 young players. The median age was 15.29 ($\pm$1.54) for regional team players and 14.69 ($\pm$2.82) for FBMRM players.

Instruments

Before data collection was carried out permission was obtained from the FBMRM and from the teams' trainers. Data were collected in the presence of an interviewer using a self-administered questionnaire. Coaches and players were informed of the purpose of the study and anonymity of their responses.

Procedure

The data corresponding to the different club and regional teams were provided by the FBMRM. The variables recorded were gender, category and year of birth. It is worth noting that in the case of handball the system to assign players to different competition categories results in groups including players born in two consecutive years. In general, the RAE research we consulted distributes players' date of birth quarterly (quartiles), but here we have also grouped them according to semester of birth. Variables were calculated and recodified in quartiles taking into account the quarter of birth of each player (Q1 January-March, Q2 April-June, Q3 July-September and Q4 October-December) and semester of birth (1st January-June and 2nd July-December).

Data analysis

Descriptive statistics and frequencies were calculated. A chi-square (χ^2) test was carried out to check whether being born in a specific year period was an advantage or disadvantage when it came to making a team. Furthermore, we carried out an analysis of the differences in percentage distribution per quarter or semester of birth according to gender and category both for regional and club teams in the 2015/2016 season. Following that we compared the proportions in the columns using Z tests and the Bonferroni method to correct p values. Calculations were carried out with SPSS Statistics 20.0

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Results

Analysis according to quarter and semester of birth in regional and FBMRM club teams in the 2015/2016 season

Results related to sample distribution according to quarters (quartiles) and semesters of birth are shown in Figure 1. In terms of quarters, players born in the first quartile are the most numerous in both samples though it is worth noting that percentage differences between quartiles are much sharper in the case of Murcia regional team players. The analysis according by semester clearly reflects the same trend; percentage differences are lower in FBMRM club players in the 2015/2016 season.

$\chi2$ tests showed statistically significant differences according to quarter of birth both for regional team players ($\chi2(gl=3)=22,28$; $p=.000$) and for club players ($\chi2(gl=3)=10,17$; $p=.017$). These results were more clearly confirmed once the $\chi2$ test was carried out according to semester of birth both for players in regional teams ($\chi2(gl=1)=9,33$; $p=.002$) and club players ($\chi2(gl=1)=8,24$; $p=.003$).
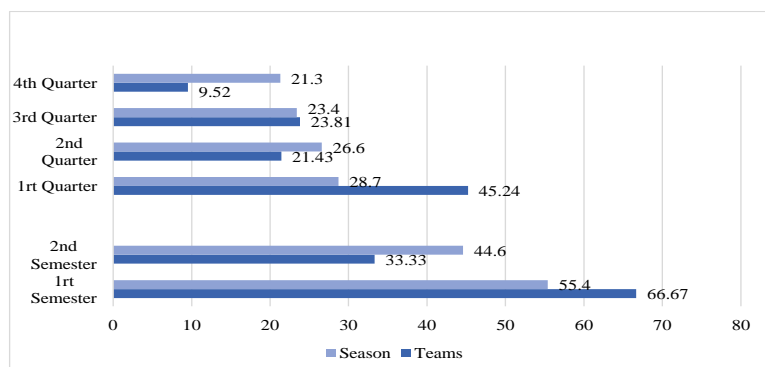

Fig.1. Sample distribution according to quarter (left) and semester (right) of birth.

Analysis by gender and category in regional teams, season 2015/2016

As seen in Table 1, the results of the $\chi2$ test showed statistically significant differences in terms of quarter of birth only in player category ($\chi2(gl=3)=15,91$; $p=.017$). Children's and junior categories show higher percentages in the first quartile. Junior players showed the most homogeneous percentage distribution across the four quartiles analyzed. The analysis by semester shows that whereas in the children's and junior categories those born in the first six months of the year are predominant, even more so in the junior category, those born in the second semester obtain the highest percentages in the youth category.

Furthermore, even though no statistically significant results were found in terms of gender, the percentage distribution was identical in the first two quartiles for both boys and girls. However, there is a higher percentage of male players in the third quartile, whereas in the case of girls, the highest percentage is seen in those born in the fourth quartile.

Table 1. Total percentages of players according to gender and category by quarter (Q) and semester of birth of in regional teams. Differences shown by chi-squared test

Quartile	Gender (%)		Chi-squared test		Category (%)			Chi-squared test	
	Male	Female	χ^2	*p*	Children's	Junior	Youth	χ^2	*p*
Q1	50,0	50,0			44,8	36,8	18,4		
Q2	50,0	50,0	0,70	0,873	11,1	33,3	55,6	15,91	0,017
Q3	55,0	45,0			45,0	20,0	35,0		
Q4	37,5	62,5			0,0	50,0	50,0		
Semester									
1º	50,0	50,0	0,00	0,591	33,9	35,7	30,4	0,75	0,687
2º	50,0	50,0			32,1	28,6	39,3		

Note χ^2= chi-squared value; *p* is significant at .05. Each subscript letter denotes a sub-set of semesters and categories whose column percentages do not significantly differ at the .05 level.

Analysis by gender and category of the total number of FBMRM club players, 2015/2016 season.

Table 2 reflects that the $\chi2$ tests did not show statistically significant differences in any of the cases ($p>.05$). There is a slightly significant tendency in the results related to gender by semester with a $p=.116$ value. The results of the analysis by quartile and gender reflect the fact that the percentages are much more distributed in the case of girls. With regard to male players, those born in the second semester are predominant.

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With regard to category, the junior one shows the highest percentages of players born in the final quartiles of the year. The analysis by semester shows that in the children's and youth categories players born in the first semester of the year are predominant, this difference being much sharper in relation to players born in the second semester in the case of children.

Table 2. Total percentages of FBMRM club players by gender and category by quarter (Q) and semester of birth. Differences shown by chi-squared test

Quartile	Gender (%)		Chi-squared test		Category (%)			Chi-squared test	
	Male	Female	χ^2	*p*	Children's	Junior	Youth	χ^2	*P*
Q1	56,2	43,2			42,0	35,2	22,8		
Q2	62,1	37,9	4,21	,240	37,4	43,3	19,2	6,07	,414
Q3	64,0	36,0			39,9	40,4	19,7		
Q4	65,4	34,6			32,7	45,7	21,6		
Semester									
1º	59,0	41,0	2,58	,116	39,8	39,1	21,1	1,25	,535
2º	64,7	35,2			36,5	42,9	20,6		

Note χ^2= chi-squared value; *p* is significant at .05. Each subscript letter denotes a sub-set of semesters and categories whose column percentages do not significantly differ at the .05 level.

Discussion

The first two objectives of this study were to determine the influence of RAE in FBMRM club players and in those playing in the Murcia regional handball teams in season 2015-2016, and to find out which of these two contexts is more affected. The results show that players have higher probabilities of playing handball in the Murcia region when they are born in the first semester of the year. That is, a clear RAE is observed in both samples, which is even more patent in the case of the selection process for regional teams. These results are in line with those in other studies related to different team sports (Bruner, Macdonald, Pickett, & Coté, 2014; Campos, Stanganelli, Rabelo, & Campos, 2016; Helsen et al., 2013; Prieto et al., 2015; Saavedra et al., 2015; Saether, 2015; Salinero, Pérez, Burillo, Lesma, & Herrero, 2014; Sedano, Vaeyens, & Redondo, 2015) and with other studies carried out with elite handball players (Gutiérrez, Saavedra, Contreras & Fernández, 2012; Karcher et al., 2014; Sánchez-Rodríguez, Yáñez, Sillero & Rivilla-García, 2012; Sánchez-Rodríguez, Grande, Sampedro & Rivilla-García, 2013; Schorer, Baker, Büsch, Wilhelm & Pabst, 2009a; Schorer, Cobley, Büsch, Bräutigam & Baker, 2009b; Schorer, Baker, Lotz & Büsch, 2010; Schorer, Wattie & Baker, 2013). Furthermore, this tendency observed in development stages has also been shown in other studies (Gómez-López et al., 2017; Sáenz-López, Feu & Ibañez, 2006; Vaeyens, Philippaerts & Malina, 2005; Gutiérrez, Pastor, González & Contreras, 2010).

This reflects the fact that both regional team and club coaches find that, practice and training conditions being equal, the month of birth variable is decisive for players' performance and therefore in the formation of a team. Players born in the first months of the year have more chances of making a team given that, as a consequence of their more advanced maturity level, they have higher level physical and coordination qualities in relation to those born later in the year. This will give selected players a higher number of opportunities and better sports' experience (training camps, monitoring, access to more qualified coaches, etc.), which in turn will affect their motivation and growth in a positive way.

The third objective was to analyze RAE according to gender and category. The results show different distributions according to gender, RAE being lower in regional teams as reflected in the fact that distributions are similar by semester. In male players, those born in the third quartile are predominant whereas in the case of girls the fourth quartile is predominant. However, there are percentage differences when it comes to club players. The results reflect a higher RAE in girls as those born in the first semester, and more specifically in the first quartile, are predominant. In terms of male players, those born in the second semester and more specifically in the last quartile are predominant. These results show that club team coaches give more importance to players' date of birth than regional team coaches, especially in the case of girls' teams.

A review of the existing literature reveals that the bulk of studies refer to samples made up exclusively of male players (Ishigami, 2015). Our results are nonetheless in line with those in other studies on other team sports such as football (Delorme, Boich y Raspaud, 2010; Helsen, van Winckel, & Williams, 2005; González, 2007), handball (Goldschmied, 2011; Schorer et al., 2009a), ice hockey (Wattie, Baker, Cobley, & Montelpare, 2007) and basketball (Goldschmied, 2011) in which no statistically significant results were found in female players.

On the other hand, the results in our study contradict those in numerous studies in which RAE was less marked or even non-existent in female players regardless of the sport practiced (Cobley et al., 2009; Delorme et al., 2009; Gutiérrez, Saavedra, Contreras & Fernández, 2012; Helsen, Hodges, van Winckel & Starkes, 2000; Leite, Borges, Santos & Sampaio, 2013; Saavedra-García, Gutiérrez-Aguilar, Sa-Marques & Fernández-Romero, 2015).

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Furthermore, we also found studies like Delorme & Raspaud (2009) and Kirkendall (2014) on football players and Nakata & Sakamoto (2012) on players of six different sports, which show statistically significant results for both genders, while Vincent & Glamser (2006) on football players and Okazaki et al. (2011) on volleyball reveal statistically significant results for women.

These differences in results for men and women may be due to a series of factors. Following Musch & Grondin (2001), RAE in handball is more intense and more common in young boys than in girls because the competition level is generally higher in the case of male players (Vicent & Glamser, 2006) and also because differences in physical development are less marked in the case of girls (Delorme et al., 2009). Another explanation could be that in Spain this sport is still more popular among boys when compared to girls, which makes it easier to detect RAE in the former case (Nakata & Sakamoto, 2012).

In terms of player category, the results reflect different distributions in both samples for all categories except children, in which those players born in the first semester of the year are predominant. A small change in this tendency is observed in the case of regional teams as RAE decreases as players move up in category; in regional youth teams players born in the second semester are predominant, whereas in the case of club players those born in the second semester are prevalent with the junior category featuring the highest number of players born in the last quarters of the year.

Based on these results, it would be important to raise awareness in coaches in charge of recruiting handball players for regional teams in the aforementioned categories of the consequences of choosing players based only on maturity level (abandonment rate, sports careers cut short, etc.). Furthermore, handball federations and clubs management should think about adjusting player selection criteria in these categories. It is also necessary to advance knowledge on the effects of RAE in handball players so that research results can be used by coaches and performance analysts to adjust and reorganize the long-term handball training and development process.

Conclusions

The samples analyzed confirm the effects of RAE, which is higher in regional team players. Thus this study shows a significant imbalance in terms of the quarter of birth of handball players in the sample; date of birth is proved to be a relevant factor in the Murcia Regional handball teams. Finally, it is worth highlighting that significant differences were found only in terms of player category in regional teams.

Acknowledgments

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