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Key-Words: Relative Age Effect, Soccer, Dropout

Abstract

The aim of this study was to examine the birthdates distribution of French male soccer players (*n* = 363,590) who dropped out during or after the 2006-2007 season, to test whether the Relative Age Effect (RAE) is linked to the dropout behaviour. An over-representation of players born late in the competitive year was found among dropouts, from the U9 to the U18 age categories, whereas their counterparts born earlier in the year were under-represented. The distortion of the distribution was particularly important for the extreme quarters of the competitive year, and in the U13 and U15 categories. This biased distribution was however not confirmed regarding the U7 category. Finally, regarding the adult category, an unbiased distribution of dropouts was found as hypothesized. Practical implications to avoid the negative consequences of RAE are advanced.

Introduction

In order to equalise competition, sport organizations set up systems of age categories, based on the birthdates of young participants. Most of the time, those categories comprise 2 consecutive years. Yet, even if the primary purpose of such systems is to enhance the chances of success for every child, this way of grouping young players is likely to generate important differences in terms of relative age. Indeed, two children belonging to the same category may have up to 23 months of differences in age. This can lead to significant differences concerning physical (Tanner & Whitehouse, 1976) and cognitive development (Bisanz, Morrison & Dunn, 1995), particularly around the time of puberty. In their study on young French basketball players, Delorme and Raspaud (2009a) observed important discrepancies in height between players from the same age category, depending on their quarter (i.e., three consecutive months) of birth. The largest mean differences approximated 10 centimetres among girls from the 11-12 years old category, and almost reached 12 centimetres for the male 13-14 years old category.

Thus, given these differences in relative age, children born early in the competitive year possess developmental advantages (i.e., in height, body mass, and strength) which will probably have a positive impact on their potential as perceived by external experts in the field (Helsen, Van Winckel & Williams, 2005). Those young participants are more frequently identified as gifted or promising, and are more easily recruited in training centres and/or national groups, which often represents the first step of a professional career. This early exposure to high level coaching may accelerate development leading to more elaborated technical and strategic competencies (Williams, 2000; Ward & Williams, 2003). Such a selection strategy (i.e., favouring an early physical development which may disadvantage athletes born late in the competitive year) leads to an unbalanced distribution of birthdates among elite players, with an over-representation of players born at the beginning of the

competitive year, and an under-representation of players born later. This phenomenon was initially observed by Barnsley, Thompson and Barnsley (1985) and has been called the relative age effect (RAE). Given the potential financial gains for athletes in certain sports, the RAE is seen as discriminatory, because it significantly reduces the chances of progressing to the elite for young players born late in the competitive year (Simmons & Paull, 2001; Edgar & O'Donoghue, 2005; for an exhaustive review on the determinants and mechanisms of the RAE in sport, see Musch & Grondin (2001) and Cobley , Baker, Wattie & McKenna, (2009)).

Together with ice hockey, soccer has been to date the most studied sport with regard to this phenomenon. The RAE has been detected in professional championships of numerous countries from several continents: in the United Kingdom (Dudink, 1994), in Belgium (Helsen, Starkes & Van Winckel, 1998), in Spain (González Aramendi, 2007), in France, in the Netherlands (Verhulst, 1992), in Australia, in Brazil, in Germany and in Japan (Musch & Hay, 1999). A similar, dissymmetrical distribution has also been observed among youth elite teams (e.g., Baxter-Jones, 1995 ; Brewer, Balsom & Davis, 1995 ; Helsen et al., 2005). However, as noted by Wattie, Cobley and Baker (2008), despite the growing body of studies, "the majority of relative age research in sport has sought to simply identify the existence (or non-existence) of RAEs in terms of who are selected for participation at a particular skill level". Yet, as underlined by Musch & Grondin (2001), RAE is not only suspected to generate discrimination in the selection process, but also to lead to dropout among less advantaged players (i.e., born at the end of the year).

Indeed, because of the disadvantages resulting from relative age (i.e., less advanced physical development; Sherar, Baxter-Jones, Faulkner & Russell, 2007; Delorme & Raspaud, 2009a), it is assumed that the young players born late in the competitive year experience more situations of failure and inferiority in their practice, and may be disadvantaged by a smaller time of play during official events. Indeed, Vaeyens, Philippaerts and Malina (2005)

demonstrated that players born early in the competitive year received more opportunities to play than their late-born counterparts. Because of this less positive experience, it is likely that those young players will gauge lower feelings of competence in the activity and should ultimately stop to practice it. Past studies conducted on dropout from team sports actually revealed that a reduced time of play (Guillet, Sarrazin, Carpenter, Trouilloud & Cury, 2002) and a low perceived competence (Ommundsen & Vaglum, 1991a, 1991b; Guillet *et al*., 2002) significantly account for a decreased psychological commitment and higher rates of dropout.

To our knowledge, only one study aimed at investigating whether RAE could account for dropout from the activity: Helsen, Starkes and Van Winckel (1998) were interested in RAE and its potential influence on success and persistence among Belgian soccer players. They observed a regular distribution of birthdates in the 6-10 years old category but a biased distribution in the 12-16 years old category, and further inferred that "from 12 years on, there were a higher number of dropouts from those players born toward the end of the selection year" (p. 794). Nevertheless, no data were available concerning dropout during or at the end of the studied season. It is therefore not possible to know if this biased distribution from 12 years old on is the result of dropout, or a self-restriction before beginning the activity. Indeed, one can argue that because of the important differences in physical attributes, there are more beginners born early in the competition year compared to children born later, in this age category. The biased distribution could thus be due to the fact that new participants create an asymmetry which would not result from higher rates of dropout among players born late in the competitive year.

The purpose of this study is to examine the birthdates distribution of French male soccer players who ceased their participation in the middle or at the end of the 2006-2007 season, so as to test whether RAE is actually related to the dropout behaviour. We hypothesize that young players born late in the competitive year would be over-represented in the dropout

sample. Conversely, because of their relative age and its associated advantages, the young players born early in the year should be under-represented in this sample.

Concerning the ‘adults’ category, we expect an unbiased distribution of the dropouts. Indeed, Baümler (quoted by Musch & Grondin, 2001) found a negative correlation between RAE and age. The author suggests that the physical advantage of soccer players born in the first half in the competition year decreases gradually and corresponds to a shift towards players with better technical attributes, even though they may have suffered a disadvantage in terms of relative age when they started. Consequently, the dropout phenomenon should be independent of the RAE in the ‘adults’ category.

To sum up, the two following hypotheses are formulated:

1) We expect a biased distribution of dropouts in young categories.

2) We expect an unbiased distribution of dropouts in ‘adults’ category.

Method

Data collection

At the end of the 2007-2008 season, the birthdates of the French male players (n = 363,590) licensed during the 2006-2007 season and that had not reiterated their licence during the following season were collected through the database of the French Soccer Federation (FSF). The identification of dropout players was facilitated by the fact the FSF attributes one and only one number to each individual. We waited until the end of the 2007-2008 season to collect the data, in order to avoid considering as dropout some players that took their licence while the new season had already begun.

Among male players, the FSF distinguishes seven age categories: U7 (less than 7 years old), U9 (7 and 8 years old), U11 (9 and 10 years old), U13 (11 and 12 years old), U15 (13 and 14 years old), U18 (15, 16 and 17 years old) and adults (18 and more than 18 years old).

Data analysis

In the literature, the presence or absence of RAE is determined by examining whether a significant difference exists between the theoretical number of players born per month or quarter and the observed number of players. Hence, for each of the seven age categories distinguished by the FSF, the players' birthdates were classified into 4 quarters. As the cut-off date has changed in France (Jullien, Turpin & Carling, 2008), players born before 1982 were classified from Q1 (August-October) to Q4 (May-July), whereas those born in 1982 and after were classified from Q1 (January-March) to Q4 (October-December). Then, a chi square goodness-of-fit test was carried out to determine whether the observed distribution by quarter significantly differed from the theoretical distribution.

Usually, in the studies investigating RAE, the theoretical distribution is calculated based on the birthdates in the whole population of the country concerned, for the corresponding years, using weighted mean scores. This procedure implies an *a priori* postulate according to which the birthdates distribution among the whole population of licensed players in one sport is similar to the one of the general population. However, a recent study by Delorme, Boiché and Raspaud (2010) indicates that when considering all male players of each age category of the FSF during the 2006-2007 season, the birthdates distribution was already biased, compared to the national data. This result suggests that the traditional method for examining the presence of RAE may not always be relevant and might introduce bias in the conclusions drawn up about this phenomenon. In this case, taking the national population as reference in order to calculate the theoretical distribution of birthdates may lead one to conclude to the

absence of RAE in the dropout sample. As a consequence, in order to avoid this kind of bias, the theoretical distributions considered in the present study will be those from the corresponding population of licensed players, using weighted mean scores.

Results

Table 1 presents the total rates of dropout for each age category among male soccer players during the 2006-2007 season.

**** Insert Table 1 approximately here ****

It is noteworthy that the dropout rate constantly increases with age among youth categories. Whereas there are only 8.11% of dropout cases for U7 category, the rate is superior to 25% among the U18 group. Among adults, the dropout rate reaches 23.49%, when the mean turnover percentage all groups confounded is equal to 19.85%.

It is also remarkable that among all youth categories, the U7, U9 and U11 represent the biggest categories in terms of participation, whereas the U15 is the smallest one.

Table 2 presents the birthdates distribution of dropout players for each age category during the 2006-2007 season.

**** Insert Table 2 approximately here ****

A significant distortion between the theoretical and observed distribution was revealed by the chi square test, regarding a majority of the youth categories, more precisely for the U9 (χ^2 = 141.71, d.f.= 3, P <.0001), U11 (χ^2 = 102.79, d.f.= 3, P <.0001), U13 (χ^2 = 188.30, d.f.= 3, P <.0001), U15 (χ^2 = 192.57, d.f.= 3, P <.0001) and U18 years (χ^2 = 45.42, d.f.= 3, P <.0001). In those five categories, the players born in the last two quarters of the competitive year were over-represented, whereas those born in the first two quarters of the year were under-represented, compared to the whole population of licensed players. The differences

between theoretical and observed values were particularly high regarding the extreme quarters (i.e., the first and the last quarters of the competitive year). The asymmetry was particularly marked for U13 and U15 categories.

No significant difference between the theoretical and observed distribution appeared concerning the U7 (χ^2 = 4.81, d.f.= 3, *P* <.186) and adult categories (χ^2 = 1.51, d.f.= 3, *P* <.680).

Discussion

In their review of the literature concerning the RAE in sport, Musch and Grondin (2001) underlined that recent work on sport dropout highlighted several psychological and sociological factors accounting for this phenomenon, but did not take into account the potential role played by RAE. Helsen and his colleagues (1998) sought to investigate this issue, but they failed to provide data regarding the distribution of dropout players' birthdates by quarter. The present study thus completed this line of research by examining whether the RAE was actually linked to the dropout behaviour.

Because of the differences in physical and cognitive development as a result of relative age, we hypothesized that a biased distribution should be observed among dropout players of youth categories from the FSF. Because they are less physically developed, and might not benefit from enough opportunities to play, especially around the time of puberty, the players born at the end of the competitive year should dropout from soccer in greater proportions, compared to their counterparts born at the beginning of it. In line with this assumption, an over-representation of players born in the last quarter was observed among dropout players, from the U9 to the U18 age categories, whereas the players born during the first two quarters were under-represented. The hypothesis was however not confirmed regarding the U7 category, where the birthdates distribution was similar to the one observed among all licensed

players. Finally, regarding the ‘adults’ category, an unbiased distribution of dropout players’ birthdates was found, as hypothesized.

In the U7 category, the absence of effect can be explained by two elements. Firstly the differences in terms of physical attributes remain modest. For instance, Delorme and Raspaud (2009a) showed that among young basketball players of 7 years old, the mean difference in height was only equal to 2.83 centimetres between players born in the first and the last quarters. The physical benefits associated with relative age thus seem limited for this age category. Next, it must be noted that the FSF does not organize any official competitions or championships for this age group. These young players only participate in recreational tournaments at the end of the season. According to Musch and Grondin (2001), competition is a necessary condition for RAE to emerge. Indeed, if there is low or no competition between players to belong to the team, every one of them may benefit from the same opportunities to play, whatever his/her physical development. As the authors notice, “the larger the pool of potential players, for a given sport in a given category, the strongest the resulting RAE should be” (p. 154). Thus the players from this category are less likely to be confronted to situations of failure or inferiority, and they may not see their time of play diminish at the benefit of other players. The low rate of dropout (8.1%) observed in this age group tends to support this explanation (see Table 1).

Regarding the other youth categories (i.e., from less than 9 to less than 18), the RAE hypothesis was confirmed. It should be noted that there is not yet an official championship for the U9 category. However, important physical disparities arise at this age among boys. For example, Delorme and Raspaud (2009a) reported a mean difference in height of 9.75 centimetres between less than 9 basketball players born in Q1 and Q4. This may imply a physical inferiority during the game and more frequent experiences of failure for the latter. The dropout rate is almost doubled compared to the one observed in the younger category

(see Table 1). For those players, as for those of older youth categories, the differences in physical attributes and the subsequent reduced opportunities to play, associated with lowered self-worth perceptions and perceived competence, are likely to lead to higher dropout rates (Ommundsen & Vaglum, 1991a, 1991b; Guillet *et al*., 2002).

The categories showing the most important effects were the U13 and U15 groups (see Table 2). It is during this period that a identification process occurs and that selections are made by the FSF and decentralized organisations to orientate certain players toward elite groups (Jullien *et al*., 2008). In each age category, there is an increased competition, which is likely to enhance the RAE (Musch & Grondin, 2001) and might encourage dropout for the players born at the end of the year. It is also during this period that one can observe the greatest physical disparities since the puberty peak occurs around 14 years for French males (La Rochebrochard, 2000). Given this important concurrency associated to high differences in physical attributes, the RAE is thus maximised in these two age categories. Furthermore, there may also be conflicts between several activities practised during adolescence that are resolved when one sport is chosen against the others. The dropout of soccer found in this study may be the results of this change. In this vein, Delorme and Raspaud (2009b) found that in shooting sports, male membership holders are significantly over-represented in Q4 for the 15-17 years old category. This “reverse” RAE is the result of a greater participation in this activity by children born in Q4 compared to those born in Q1. These authors suggest that this phenomenon could be explained by the presence of “weak” players in the 13-14 years old category, who changed sports after failing in disciplines in which developed physical attributes are important for success. In the case of a transfer from one sport to another, children will continue to benefit of the multiple benefits of moderate but regular sport participation for social acceptance, psychological self-perceptions and health. The worse scenario is a definitive dropout from sport and/or physical activity.

It should also be pointed out that the most impressive dropout rate is the one observed for the U18 category (25.52%). This group comprises three consecutive years, instead of two for the younger groups. Thus, a player born in December who progresses to this category can potentially be opposed to players born 35 months earlier. It is consequently in this group that relative age is the most important. However, the highest disparities in birthdates distribution are not observed in this age group. It is noteworthy that in this particular case, even some of the players born in Q1 or Q2 are susceptible to experience the disadvantages linked to relative age. As a consequence, they should drop out from soccer in similar proportions than their counterparts born later in the year. This may explain the reduced intensity of the phenomenon for U18 players.

Finally, a distribution similar to the one observed among the whole population of licensed adult players was observed among adult dropout players. This result is consistent with past studies having shown that RAE gradually declines with age in the German professional championship (Baümler, quoted by Musch & Grondin, 2001). The physical advantages for players born in Q1 and Q2 decrease with time, and the diminution of the RAE can be viewed as the consequence of the prevalence of technical attributes as players grow up. The RAE thus becomes inoperative and should not lead to dropout anymore. The high rate of dropout reported (23.49 %, see Table 2) masks an important variation according to age. Indeed, this value steadily decreases from the beginning of this category (almost 41% of dropout for the 18 to 25 years) to its end (only 2.28% for the players aged 50 years and more). The massive dropout at the beginning of adulthood is common to all sports and can be mainly explained by factors external to the activity itself. Indeed, field studies in sport psychology indicates that conflicts of interest arise with development, between sport and other domains, which negatively influence sport involvement (e.g., Boiché & Sarrazin, 2007). Those players have to assume educational, professional or familial responsibilities that might take them

away from playgrounds. The potential influence of relative age on dropout should consequently be examined essentially among youth athletes.

Conclusions and Practical Implications

The results of the present study, together with those of Helsen *et al*. (1998), confirm that the RAE can act as a sport dropout factor. This work is the first to bring empirical data on the biased distribution of birthdates of players that ceased their sport participation. The results can further be set in prospect with the study of Delorme, Boiché and Raspaud (2010) in the more general realm of sport involvement. Indeed, even if dropout seems evenly distributed in the U7 category, those authors found a RAE for the whole population of licensed soccer players of this age. It means that a "self-restriction" process exits, by which children born late in the competitive year do not even start to practice this sport, when children born in the first part of the year are over-represented among beginners. The RAE thus show two potential paths of influence on involvement: on the one hand, children born at the end of the competitive year are dissuaded to engage in sport; on the other hand, those who do engage are more prone to dropout from it a few years later.

Because sport is aimed at promoting the development of every child, some authors have made suggestions so as to attenuate this effect and maintain motivation among all participants (Musch & Grondin, 2001), for example, building teams based on quarters of birthdates. However, those suggestions sometimes seem difficult to apply, given the small number of players in small teams. In any case, coaches' awareness of this phenomenon should be increased. They have a central role in the sport system and should be willing and able to explain to children and adolescents that their physical deficits are only temporary, that the gap will ultimately be filled with time/growth, and that more controllable factors are important to succeed in sport. Even if coaches seem the most likely to take an active part against this

phenomenon, their efficacy in doing so might also depends from their organisations' politics, and the way their discourse is heard and supported by parents of players.

References

Barnsley, R.H., Thompson, A.H. & Barnsley, P.E. (1985). Hockey success and birthdate: The RAE. *Canadian Association for Health, Physical Education and Recreation, 51,* 23-28.

Baxter-Jones, A. (1995). Growth and development of young athletes. Should competition levels be age related? *Sports Medicine, 20,* 59-64.

Bisanz, J., Morrison, F. & Dunn, M. (1995). Effects of age and schooling on the acquisition of elementary quantitative skills. *Developmental Psychology, 31,* 221-236.

Boiché, J.C.S. & Sarrazin, P.G. (2007). Self-Determination of Contextual Motivation, Intercontextual Dynamics and Adolescents' Patterns of Sport Participation over Time. *Psychology of Sport and Exercise, 8,* 685-703.

Brewer, J., Balsom, P. & Davis, J. (1995). Seasonal distribution amongst European soccer players. *Sports Exercise and Injury, 1,* 154-157.

Cobley, S., Baker, J., Wattie, N. & McKenna, J. (2009). Annual age-grouping and athlete development. A meta-analytical review of relative age effects in sport. *Sports Medicine, 39,* 235-256.

Delorme, N., Boiché, J. & Raspaud, M. (2010). Relative Age Effect in Elite Sports: Methodological Bias or Real Discrimination? *European Journal of Sport Science, 10,* 91-96.

Delorme, N. & Raspaud, M. (2009a). The relative age effect in young French basketball players: a study on the whole population. *Scandinavian Journal of Medicine & Science in Sports, 19,* 235-242.

Delorme, N. & Raspaud, M. (2009b). Is There an Influence of Relative Age on Participation in Non-Physical Sports Activities? The Example of Shooting Sports. *Journal of Sports Sciences, 27,* 1035-1042.

Dudink, A. (1994). Birth date and sporting success. *Nature, 368,* 592.

Edgar, S. & O'Donoghue, P. (2005). Season of birth distribution of elite tennis players. *Journal of Sports Sciences*, *23*, 1013-1020.

González Aramendi, J.M. (2007). El efecto relativo de la edad en el fútbol [The relative age effect in football]. *Archivos de Medicina del Deporte*, *24*, 9-17.

Guillet, E., Sarrazin, P., Carpenter, P., Trouilloud, D. & Cury, F. (2002). Predicting persistence or withdrawal in female handballers with social exchange theory. *International Journal of Psychology*, *37*, 92-104.

Helsen, W.F., Starkes, J.L. & Van Winckel, J. (1998). The influence of relative age on success and dropout in male soccer players. *American Journal of Human Biology*, *10*, 791-798.

Helsen, W.F., Van Winckel, J. & Williams, A. M. (2005). The relative age effect in youth soccer across Europe. *Journal of Sports Sciences*, *23*, 629-636.

Jullien, H., Turpin, B. & Carling, C. (2008). Influence de la date de naissance sur la carrière professionnelle des joueurs de football français [Influence of birth date on the career of French professional soccer players]. *Science & Sports*, *23*, 149-155.

La Rochebrochard, E. (2000). Age at puberty of girls and boys in France: measurements from a survey on adolescent sexuality. *Population: An English Selection*, *12*, 51-79.

Musch, J. & Grondin, S. (2001). Unequal competition as an impediment to personal development: A review of the relative age effect in sport. *Developmental Review*, *21*, 147-167.

Musch, J. & Hay, R. (1999). The relative age effect in soccer: Cross-cultural evidence for a systematic discrimination against children born late in the competition year. *Sociology of Sport Journal*, *16*, 54-64.

Ommundsen, Y. & Vaglum, P. (1991a). The influence of attributional style on the soccer-related self-esteem and persistence in soccer of young boys. *Scandinavian Journal of Medicine & Science in Sports*, *1*, 45-50.

Ommundsen, Y. & Vaglum, P. (1991b). The influence of low perceived soccer and social competence on later dropout from soccer: a prospective study of young boys. *Scandinavian Journal of Medicine & Science in Sports*, *1*, 180-188.

Sherar, L.B., Baxter-Jones, A.D., Faulkner, R.A., & Russell, K.W. (2007). Do physical maturity and birth date predict talent in male youth ice hockey players? *Journal of Sports Sciences*, *25*, 879-886.

Simmons, C. & Paull, G.C. (2001). Season-of-birth bias in association football. *Journal of Sports Sciences*, *19*, 677-686.

Tanner, J.M. & Whitehouse, R.H. (1976). Clinical longitudinal standards for height, weight, height velocity and weight velocity and the stages of puberty. *Archives of Disease in Childhood*, *51*, 170-178.

Vaeyens, R., Philippaerts, R.M. & Malina R.M. (2005). The relative age effect in soccer: A match-related perspective. *Journal of Sports Sciences*, *23*, 747-756.

Verhulst, J. (1992). Seasonal birth distribution of West European soccer players: A possible explanation. *Medical Hypotheses*, *38*, 346-348.

Ward, P. & Williams, A.M. (2003). Perceptual and cognitive skill development in soccer: The multidimensional nature of expert performance. *Journal of Sport and Exercise Psychology*, *25*, 93-111.

Wattie, N., Cobley, S. & Baker, J. (2008). Toward a unified understanding of relative age effects. *Journal of Sports Sciences*, *26*, 1403-1409.

Williams, A.M. (2000). Perceptual skill in soccer: Implications for talent identification and development. *Journal of Sports Sciences*, *18*, 737-740.

Table 1. Dropout in French male soccer (2006-2007).

Category	Total	Dropout	%
Adults	715,060	167,949	23.49
Under 18	166,920	42,603	25.52
Under 15	144,249	31,392	21.76
Under 13	167,738	34,391	20.50
Under 11	213,484	36,504	17.10
Under 9	223,285	34,469	15.44
Under 7	200,788	16,282	8.11
Overall Total	1,831,524	363,590	19.85

Table 2. Distribution of dropout in French male soccer (2006-2007).

Category	Q1	Q2	Q3	Q4	Total	χ^2	*P*
Adults	43,003	42,135	41,420	41,391	167,949	1.51	<.680
(Δ)	(+41)	(-204)	(+138)	(+25)			
Under 18	10,766	10,971	10,879	9,987	42,603	45.42	<.0001
(Δ)	(-447)	(-199)	(+211)	(+435)			
Under 15	7,597	7,794	8,125	7,876	31,392	192.57	<.0001
(Δ)	(-775)	(-293)	(+211)	(+856)			
Under 13	7,822	8,677	9,052	8,840	34,391	188.30	<.0001
(Δ)	(-879)	(-247)	(+320)	(+806)			
Under 11	8,562	9,049	9,435	9,458	36,504	102.79	<.0001
(Δ)	(-535)	(-263)	(+53)	(+745)			
Under 9	7,969	8,559	8,965	8,976	34,469	141.71	<.0001
(Δ)	(-652)	(-275)	(+106)	(+821)			
Under 7	4,166	4,094	4,332	3,690	16,282	4.81	<.186
(Δ)	(+33)	(-101)	(+90)	(-22)			

Note: Δ is the difference between observed distribution and theoretical expected distribution.