

The Relative Age Effect (RAE) in Youth and Professional Soccer Players in Turkey

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ABSTRACT The purpose of this study was to assess the influence of Relative Age Effect (RAE) on the top league of professional soccer teams and their all competitor categories of youth teams in Turkey. Relative age effects refer to age differences in the same selection year. We compared categories in the birth-month distributions of professional and young soccer players (N=2939) in the teams (18 clubs) of the Turkish Super League (TSL). The Chi-square statistic test showed an over-representation of players born in the first month (January) and first quarter (January to March) in all categories. The RAE was a major factor in the selection of elite soccer players in Turkey. As a result, the selection is not suitable, and talented youth soccer players lose their chances. By aid of similar pre-studies focused on RAE, a current study suggested that competitor player age grades should revive for youths in the maturation phases.

INTRODUCTION

There is a phenomenal issue in education and sports called the Relative Age Effect (RAE). RAE refers to the concept that individuals born earlier in the year have an advantage over those born later when they encounter a similar task (Bell and Daniels 1990; Musch and Hay 1999; Musch and Grondin 2001; Roberts and Fairclough 2012).

Previous researches in education have revealed that among the children in the same academic age groups; the children who were born in the first quarter of the year have better cognitive, achievement and motor skills and have higher scores on standardized reading, math and spelling tests than the children who were born in the last quarter of the year (Sharp et al. 1994; McPhillips and Jordan-Black 2009; Sprietsma 2010). These differences are called RAE. RAE refers to the potential, cognitive and biological variability between the individuals in the same age group (Baxter-Jones et al. 1994; Musch and Grondin 2001).

The first research on RAE in sports that was conducted by Godin et al. revealed that among

professional ice hockey players, the ones who were born in the first months of the year, presented the highest frequency distribution (Cobley et al. 2008a). Barnsley et al. (1985) examined the distribution of ice hockey players in some teams selected among local and national leagues according to the months they were born in, and they stated that there is a high frequency accumulation in January, February, and March (first quarter of the year). Cobley et al. (2008a) reported some pre-study results that had similar asymmetries in birth-date and sport representation which have been identified in senior baseball (Thompson et al. 1991), cricket (Edwards 1994), soccer (Verhulst 1992; Dudink 1994) and in the youth sport contexts of hockey (Barnsley and Thompson 1988), soccer (Helsen et al. 1998; Glamser and Vincent 2004), swimming (Baxter-Jones 1995) and tennis (Dudink 1994).

Recently, RAEs researches in Physical Education (PE), Cobley et al. (2008a) discovered that main effects for birth-date (that is quartile) and year group on attainment in PE were found as there were interactions between gender and year group. Roberts and Fairclough (2012) found a statistical interaction between birth date quarter and end-of-year attainment in PE for 11–14 yearolds in the UK.

Categorization of competitive athletes may utilize a similar/different system than that employed by school organizations, namely categorization according to chronological age. Such categorization is aimed at allowing players appropriate participation and equal opportunity in

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training. In soccer, for the purposes of categorization, most countries adopt the FIFA (Federation International of Football Association) and UEFA (Union of European Football Associations) rule, which uses year of birth as the competitive category or the selection criterion, defining starts on January-1 and ends on December-31 as the cut-off date. Recently researches have focused on the relative age effect in youth soccer (Helsen et al. 1998; Glamser and Vincent 2004; Helsen et al. 2005; Gutierrez et al. 2010; Williams 2010). These studies clearly indicate that at many levels of play, the identification and selection of players to participate in advanced training or competitions has a clear age bias. A number of studies focused on the professional leagues in countries that revealed a high incidence of RAE, as evidenced by the fact more than 55% of players were born in the first six months of the year. Some research studies (Helsen et al. 1998; Musch and Hay 1999), clearly showed the existence of RAE in the professional soccer players. Similarly, the existence of RAE has been seen in the women's soccer teams. Romann and Fuchslocher (2011) pointed out that RAEs apparently influence the self-selection and talent selection processes of women's soccer in the 10 to 14 age category in Switzerland. However, there was no difference in the age 15 category. Some researchers reported that RAEs for females in various sports were not statistically significant (Giacomini 1999; Helsen et al. 2005; Van Rossum 2006; Wattie et al. 2007; Delorme and Raspaud 2009; Goldschmied 2011), while others determined significant RAEs (Edgar and O'Donoghue 2005; Vincent and Glamser 2006; Okazaki et al. 2011). Eventually, Nakata and Sakamoto (2012) suggested that the determinants of RAEs in sports may differ between males and females.

Cobley et al. (2009) researched the first meta-analytical review of RAEs. They collectively determined the overall prevalence and strength of RAEs across and within sports, and identified moderator variables. Research shows that some important questions have been answered about RAE as to what criteria coaches use to discover talented youth players, and if there is any evidence to suggest that their "vision" may be biased by temporary differences in growth and maturation. Additionally, it has been argued to revise cut-off dates in sports.

The professional teams and especially the elite young teams of Super League Clubs, which are the primary source of Turkish football, are

extremely important for the future of Turkish football. Researches that have been conducted in different countries emphasized the importance of the "Relative Age Effect" concept in selecting the players especially for younger age categories. The present research is a pioneer research that examines that existence of RAE in professional teams and elite young teams within the body of Turkish Super League football clubs. Therefore, the purpose of the present research reveals the existence and the extent of such an important phenomenon for Turkish football.

METHODOLOGY

Sample

The Turkish Football Federation (TFF) organizes four professional leagues for male soccer players. The Turkish Super League (TSL) is the top professional league in Turkey. 18 clubs in the TSL have football teams under 8 categories. Professional (n=411) and elite young players (n=2525); a total of 2936 male football players in 144 teams of Turkish Super League clubs form the data of the present research. Foreign players were excluded from the sample. The data were obtained from the open access web page of the TFF.

Procedure

Active players in the 2013-2014 season were analyzed according to TFF age categories; A (professional) (n=385), A2 (under professional) (n=415), U19 (Under Age 19) (n=301), U17 (n=406), U16 (n=396), U15 (n=403), U14 (n=410) and U13 (n=220). In the present season, the U18 competition category was removed by the TFF. All procedures were conducted according to the ethical standards of Mugla Sıtkı Kocman University. According to the rule of the TFF, the distributions of birth dates were determined on the basis of the applying cut-off dates which start on January 1 and end on December 31. For each category, the distribution of soccer players' birthdays was computed by month. Additionally, the data were aggregated for each quarter of the competition year (for example Q1=January, February, March) to enhance clarity of presentation.

Statistical Analysis

Firstly, the distribution of birth month of players in each category was not "Normal Distribu-

tion" according to the outcomes of Kolmogorov-Smirnov test ($p < 0.001$). Following, the chi-square statistic test was used to compare differences between the observed and expected birth-date distributions across categories and leagues. Also, birth-month distribution was shown more clearly on the graph. The statistic package software was used to perform all tests and an alpha level of 0.05 was used for all procedures.

FINDINGS

Table 1 presents the birth-months and quarter year distributions of the players in eight competition categories of TSL clubs. In addition, the differences and significances of in-category distributions are shown. According to these analyses, birth-month distributions of football players in the football teams of all categories are higher in the first months of the year, and these numbers decrease towards the latest months of the year. The differences in the distributions, according to Chi-square test are high at a statistically significant level ($p < 0.01$).

Analyses of the birth months of the 2936 soccer players of TSL teams consisting of eight elite categories revealed that the birth months are heavily skewed toward the first quarter of the year with 1315 of 2936 players born in January through March (44.79%). The Chi-square tests revealed that the difference in the monthly and quarterly birth date distribution was significant ($p < 0.01$). Chi-square test results of each category were obtained for both per month; A ($\chi^2 = 51.08$), A2 ($\chi^2 = 146.40$), U19 ($\chi^2 = 98.1$), U17 ($\chi^2 = 248.74$), U16 ($\chi^2 = 92.12$), U15 ($\chi^2 = 243.12$), U14 ($\chi^2 = 209.14$), U13 ($\chi^2 = 108.58$) and per quarter; A ($\chi^2 = 26.75$), A2 ($\chi^2 = 98.49$), U19 ($\chi^2 = 72.28$), U17 ($\chi^2 = 169.35$), U16 ($\chi^2 = 84.51$), U15 ($\chi^2 = 154.45$), U14 ($\chi^2 = 141.30$), U13 ($\chi^2 = 82.47$), ($p < 0.001$), (Table 1).

The results show in Fig.1 the birth month distribution of the soccer players in the eight competitor category of TSL Clubs. It was noted that the birth-month distribution of players decreased from January to December, with the biggest variations in comparison to the intra-category occurring at the start of the year (January, February and March) and the end of the year (October, November and December).

The months of birth with the highest proportion of players were first of the quarter (Q1=44.8%) (January, 22.2%; February, 11.9%; March, 10.6%). This was followed by Q2 where

Table 1: Birth-month and quarter distributions of the players per eight categories

Category	Jan. Q1	Feb.	Mar.	Apr. Q2	May	Jun.	July Q3	Aug.	Sep.	Oct. Q4	Nov.	Dec.	N	df	χ^2	p
A	63 127 (39.99%)	33 89	31 110	36 59 (15.32%)	26	27	40 26.75**	32 .000	38	25	17	17	385	11	51.08**	.000
A 2	92 187 (45.06%)	49 93	46 84	23 51 (12.29%)	38	32	30 98.49**	30 .000	24	25	20	6	415	11	146.40**	.000
U19	64 137 (45.51%)	39 70	34 48	30 46 (15.28%)	25	15	18 72.28**	17 .000	13	16	15	15	301	11	98.11**	.000
U17	108 206 (50.74%)	54 91	44 84	34 51 (6.16%)	33	24	39 169.35**	25 .000	20	12	2	11	406	11	248.74**	.000
U16	65 156 (39.39%)	45 121	46 87	42 32 (8.08%)	45	34	33 84.51**	29 .000	25	15	10	7	396	11	96.12**	.000
U15	110 201 (49.88%)	44 95	47 76	38 31 (7.69%)	25	32	32 154.45**	26 .000	18	12	12	7	403	11	243.12**	.000
U14	101 198 (48.29%)	58 106	39 68	42 38 (9.27%)	28	36	29 141.30**	22 .000	17	21	12	5	410	11	209.14**	.000
U13	49 103 (46.82%)	26 67	28 37	30 13 (5.91%)	14	23	14 82.47**	11 .000	12	8	3	2	220	11	108.58**	.000
Total	652 1315 (44.79%)	348 732	315 594	275 295 (10.05%)	234	223	235 749.16**	192 .000	167	134	91	70	2936	11	1055.80**	.000

** $P < 0.01$

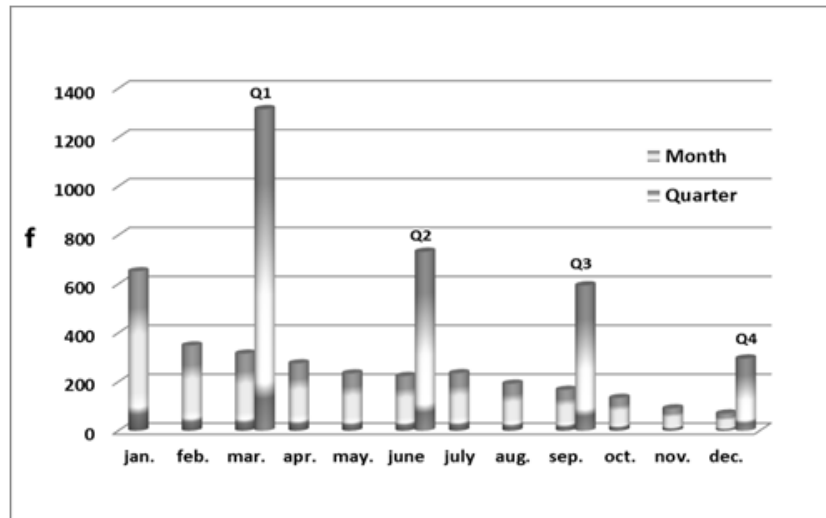


Fig. 1. Birth-month and quarter-year distributions of all players

the proportion was 24.9% and then by Q3 and Q4 (the last quarter) with a proportion of 20.2% and 10.1%, respectively. The proportions of all category players born in Q4 were lower than the other quarters (Fig. 2).

Birth-date distributions of players in all categories except for the professional teams (A) present a linear decrease from the first quarter to last quarter. Even the distribution rates among A

teams are higher in Q3 than Q2, this rate is the lowest in Q4.

The close examination of distributions in TSL teams, according to categories, presents that, the highest rates in distributions are observed in U17, U15, and U14 categories. Birth-rates in the first quarter in U17, U15, and U14 categories relatively are; 50.7%, 49.9%, and 48.3%; and the rates in the last quarter (Q4) relatively are; 6.2%, 8.1%,

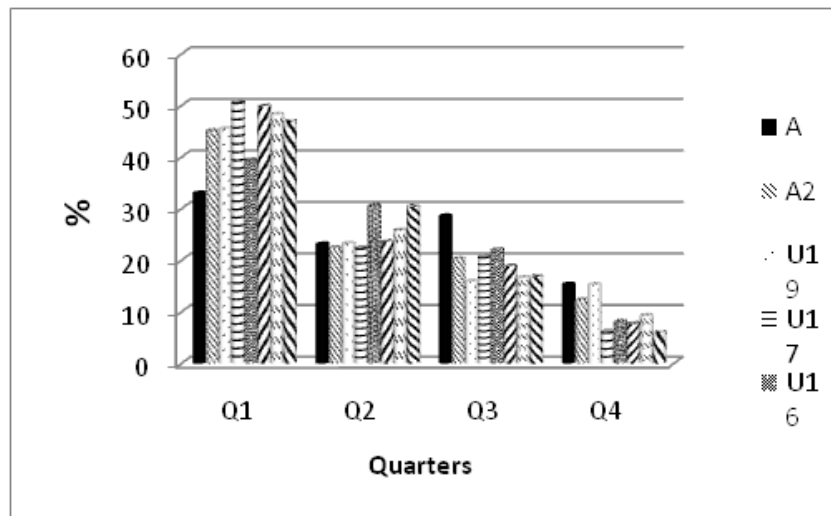


Fig. 2. Distributions of birth-quarter of the players according to categories.

and 9.3%. The lowest rate in the last quarter is observed in U13 category (5.9%) (Fig. 2).

DISCUSSION

As is the case with the previous researches conducted in other countries, the present research also revealed the existence of "Relative Age Effect" in the soccer teams in professional and elite young categories of the top clubs in Turkey. According to the findings of the present research, the significantly high trend toward the first months of the year in the birth-month and quarter year distributions of players in professional teams in Turkish Super League indicates the existence of Relative Age Effect. In the previous researches, Helsen et al. (2012) examined the existence of relative age effect (RAE) in the professional football teams of ten different European countries for the 2000-2001 and 2010-2011 competition seasons. They found that RAE presented significance in the 2000-2001 season in all countries except for Portugal and Spain; and in the 2010-2011 season, RAE is not observed except in Portugal. In their research on the historical analysis of Relative Age Effect in German Bundesliga teams, Coble et al. (2008b) presented the existence of relative age effect and its importance in the maturation-selection processes. Wium et al. (2010) pointed out the existence of RAE among Norwegian Football League professional players. According to the findings of this research, player selection criteria for early ages aren't ideal. The researches in top categories in football emphasized the existence of Relative Age Effect (RAE), and these researches present that this effect is more common among young teams in lower categories. In the present research, it was observed that in all young categories, especially in the U17, U15 and U14 teams, birth-month distribution in the first month of the year (January) and in the first quarter is significantly higher than in the last month (December) and in the last quarter of the year. This extensity of RAE indicates that, among young players that are categorized according to chronological age, players who were born earlier in the same year are selected. This negative and unfair competition among the player selection criteria for young teams, creates some important problems. In the previous researches on young players, the extensity of RAE is defined as a maturation disadvantage. Helsen et al. (2005) stated that birth-

month distributions of players have a significant effect on the U-15, U-16, U-17, and U-18 national football team selections in ten European countries. That is to say, birth-month distributions of players of all countries have a trend that decreases from the first months of the year toward the last months. In addition, they stated that there is a similar trend also in the U-16, U-18, U-14, and U-12 teams that participated in international tournaments. According to these findings, the physical superiorities of the older players over younger players evaluated the older ones as more talented. Therefore, this situation appears to be selection criteria in young soccer teams, and relative age effect (RAE) becomes more extensive in the higher categories.

Gil et al. (2014) examined the relationship between young soccer players' anthropometric and physical performances and their chronological age. According to research findings, there is a significant difference between the pre-pubertal players (9.75 ± 0.30 years) who were born in the first months of the same year and the ones born in the last months. They stated that the players who were born in the first quarter (Q1) are taller, have higher sitting height, leg length, and fat-free mass measures; in addition, they have higher scores in the 15-30m sprint test and the agility test which are physical performance tests. Similarly, physical performance scores (velocity 30 m + agility 30 m + Yo-yo IR1 + counter movement jump test) of Q1 players are significantly higher than the ones who were born in other quarters.

Carling et al. (2009) compared the anthropometric and fitness features of 160 U14 youth academy male soccer players in terms of their birth-months according to the quarters of the year (4 birth quarters). According to the findings of this research, there were no significant differences in physical performance measures. However, they stated that older players had higher scores in fitness tests than younger players. According to these findings, they stated that physical development differs among individuals and this difference can be very distinctive in the adolescence period.

As emphasized in the previous researches (Helsen et al. 1998; Delorme et al. 2010), the competition caused by the developmental advantages versus disadvantages during the talent selection among young players may result in drop-outs in sports. The present research revealed that relative age effect is observed in junior teams

and it decreases in professional team levels, and this effect presents an irregular trend in quarterly distributions. This situation necessitates the forming of the player selection criteria very carefully.

Delorme et al. (2010) examined the relationship between dropouts in sports and birthmonths among French male soccer players in the 2006-2007 season. The examination of the distribution of the players who drop out of sports, especially in five categories (U-9, U-11, U-13, U-15, and U-18), presented a significant difference between the players who were born in the last two quarters and the ones who were born in the first two quarters. The highest asymmetrical distribution was observed in the U-13 and U-15 categories. The highest difference was observed especially between the first and last quarters. They pointed out the existence of relative age effect on dropout tendencies among football players in the same age band in these categories. No significant difference was detected in the U-7 and adult categories. According to the findings of this research, even dropouts are not observed in the U-7 category. RAE can be observed in whole player population. The researchers offered two different interpretations based on this finding; first, in the U-7 category, which is the first category, the players who were born in the last months may be prone to not starting sports at all because they have developmental disadvantages compared to the ones who were born in the first months. Second, these players may be prone to dropout in talent selection processes because of this disadvantage. In the youth period, especially in adolescence, the physical and performance superiority of the players who were born in the first months over the ones who were born in the last months will disappear in puberty. In puberty, among elite players, not only physical performance comes into prominence, but football specific parameters such as technic-tactic talent and game intelligence come into prominence. Therefore, creating homogeneity in birth-month distribution will prevent dropouts in sports.

Hence, in early age talent selections and youth development processes, growing and developmental differences should be taken into consideration, and equality of opportunities should be provided by evaluating soccer-specific skills (Carling et al. 2009). In talent selection, players' anthropometric, physiological, physical, psychological and soccer-specific

technical skills should be evaluated with a multidisciplinary approach while considering the different periods of the selection years (Reilly et al. 2000) and birth-months. Additionally, timing of growth spurts in adolescence and individual differences in pace affect the sports-specific skills. Changes in the central nervous system as a biological result of adolescence affect the controlling and perception skills (Malina et al. 2007).

In their research conducted on Canadian National Hockey League players, Pierson et al. (2014) suggested that application of a model consisting of three policies will decrease RAE. These policies are as follows; P1 is an initial birthday requirement for the youngest youth league that alternates between January 1st and July 1st, P2 is a rotating cut-off policy that delays matriculation of the least age-advantaged birth-months so that every child enjoys time as the most advantaged at some point during the aging chain, and P3 is a policy that encourages extra support for the least skilled players in the youngest leagues. They offered that applying the combination of these three policies will dependently decrease RAE in 96% among Canadian hockey players.

CONCLUSION

The research results revealed the prevalence of RAE in Turkish soccer. As is the case with the previous researches conducted in other countries, the present research also revealed the existence of Relative Age Effect in the soccer teams in professional and elite young categories of the top clubs in Turkey. According to the findings of the present research, the significantly high trend toward the first months of the year in the birth-month and quarter year distributions of players in teams of Turkish Super League indicates the existence of Relative Age Effect.

RECOMMENDATIONS

It is suggested that trainers and coaches should be well-informed about child and youth development while selecting players and forming teams in early and late adolescence age categories. Especially, in order to prevent dropouts and make more accurate decisions in selection, detecting the players who are talented but have late physical and physiological maturation is very important.

Additionally, in the prevention of RAE phenomenon starting from lower categories, federations that organize the football competitions are as responsible as the trainers. In accordance with the opinions of child development experts, narrowing down the one-year range, especially in adolescent period groups while planning the competition age categories, may solve this problem. Parents who are informed about the issue can be supportive in this important process by communicating effectively with other parties. That the present research revealed the existence of RAE in the sample that forms an important part of Turkish football sheds light for further researches. For example, more specific solutions can be offered by examining the real reasons for the existence of RAE. Subjects such as trainers' opinions, player expectations, and principles of rule makers related to the existence of this phenomenon may be researched. These suggestions and presumptions aim at preventing the negative effects on young players and Turkish football of RAE, the existence of which has been revealed in many countries in different sports.

LIMITATIONS

This research was limited to 18 TSL Clubs which are pioneers of Turkish Soccer. Every one of them has eight category teams of one professional and seven elite youth teams.

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