Spor Bilimleri Araştırmaları Dergisi
Journal of Sport Sciences Research
Vol:8, Issue:1, February, 2023
E-ISSN: 2548-0723
URL: http://www.dergipark.org.tr/jssr

A Study of Relative Age Effect in Professional Leagues (The Sample of Turkish Super League, 1st League, 2nd League and 3rd League)

Oğuz GÜRKAN[1*], Mehmet YILDIRIM[1]

[1] Yozgat Bozok University, Faculty of Sports Sciences, Yozgat, TÜRKİYE.

Original Article
Received: 18.07.2022 Accepted: 15.01.2023 **DOI: 10.25307/jssr.1145002** Online Publishing: 28.02.2023

Abstract

This present study aims to examine the phenomenon of the relative age effect among football players based on birth year and the positions they played in Turkish professional leagues. A total of 3622 professional football players from Turkish Super League, Spor Toto 1stLeague, 2ndLeague and 3rd League were included in the study. The players were divided into 4 different quarters with 3-month intervals and 2 different half-terms with 6-month intervals starting from January. The data of the second half of the 2021-2022 football season were used in the research. The data of the study were obtained from the official and open-access web pages of the Turkish Football Federation and Transfermarkt. With the chi-square test, the distribution of the football players according to birth months, positions and leagues and the frequency distribution differences between the groups were analyzed. SPSS 22 statistical package program was used to analyze data and the significance level was accepted as $p<0.05$. As a result, it has been observed that the number of football players born in the first quarter and the first 6 months of the year in all of the professional leagues in Turkey is more than the players born in the other quarters of the year, and the results were found statistically significant. In addition, it has been determined that there are more football players born in the first months of the year in all positions according to the leagues. As a result, the presence of relative age effect in football players playing in professional leagues in Turkey has been revealed.
Keywords: Football, Relative age effect, Turkish professional leagues

Profesyonel Liglerde Bağıl Yaş Etkisinin İncelenmesi (Türkiye Süper Lig, 1. Lig, 2. Lig ve 3. Lig Örneği)

Öz

Bu çalışma, Türkiye profesyonel liglerinde oynayan futbolcuların doğum yıllarına ve oynadıkları mevkilere göre bağıl yaş etkisinin varlığını incelemek amacıyla yapılmıştır. Çalışmaya süper lig, spor toto 1. lig, 2. lig ve 3. lig kulüplerinde oynayan toplam 3622 profesyonel futbolcu dahil edilmiştir. Futbolcular ocak ayından itibaren 3'er ay ara ile 4 farklı çeyrek döneme ve 6 ay ara ile 2 farklı yarım döneme ayrılmıştır. Araştırmada 2021-2022 futbol sezonunun ikinci yarısındaki veriler kullanılmıştır. Çalışmanın verileri erişime açık olan, Türkiye Futbol Federasyonunun resmi web sayfasından ve transfermarkt web adresinden elde edilmiştir. Futbolcuların doğdukları aylara, mevkilere ve liglere göre dağılımları ve gruplar arası frekans dağılım farklılıkları ki-kare (chi-square) testi ile analiz edilmiştir. Verilerin analizlerde SPSS 22 istatistik paket programı kullanılmış ve anlamlılık düzeyi $p<0,05$ kabul edilmiştir. Elde edilen araştırma bulgularına bakıldığında, Türkiye'deki profesyonel liglerin tamamında yılın ilk çeyrek ve ilk 6 aylık döneminde doğan futbolcuların yılın diğer çeyrek dönemlerinde doğan futbolculara göre daha fazla sayıda oldukları ve elde edilen sonuçların istatistiksel olarak da anlamlı olduğu gözlenmiştir. Ayrıca, liglere göre tüm mevkilerde (kaleci, kanat bek, stoper, kanat forvet, santrafor, merkez orta saha) sayısal olarak yılın ilk aylarında doğan futbolcuların daha fazla olduğu da tespit edilmiştir. Sonuç olarak, çalışmamızda Türkiye'de profesyonel liglerde oynayan futbolcularda bağıl yaş etkisinin varlığı ortaya konmuştur.
Anahtar Kelimeler: Futbol, Bağıl yaş etkisi, Türkiye profesyonel ligleri.

[*]**Corresponding Author:** Oğuz GÜRKAN, **Email:** oguz.gurkan@bozok.edu.tr

INTRODUCTION

The Relative Age Effect (RAE) has recently become a popular topic in the field of sports sciences (Mujika et al., 2009; Wattie et al., 2015). RAE refers to the phenomenon by which children born early in their year of birth perform more highly than children born later in the same cohort. Relative age can also be defined as the physical, cognitive and motoric developmental levels of athletes who were born earlier in the same year than those born in the last months of the year. RAE first came to the fore in 1985 at an ice hockey game with casual observation. Later, this, starting as an observation, evolved into more comprehensive research as a result of analyzing the staff of other ice hockey and football teams. Today, it has become the focus of worldwide research (Barnsley et al., 2020). Especially in the last two decades, it has been determined that the incidence of RAE has increased in popular sports such as football (Wattie et al., 2015).

There is a 12-month growth difference between a child born in January and a child born in December. The fact that the athletic characteristics of older children are better than those of younger children means that these children's athletic performances and football skills are better. Physical, mental, and athletic features that develop in parallel with growth provide an advantage for being selected for elite and national team categories (Akkoç & Göksu, 2020). Anatomical age clearly illustrates the complexities of growth and development that help explain why motor abilities develop in some children faster or slower than others. A more mature child learns more skills faster than a less mature one. Biological age refers to the physiological maturation of the body's organs (Bompa & Carrera, 2015). It helps determine the physiological potential to achieve high performance. Unfortunately, in many sports branches, coaches use chronological age as the main criterion in order to classify their athletes. Many studies have shown that children born in December are less likely to achieve success in sports organizations than children born in January of the same year (Bompa & Carrera, 2015).

With the advantage of the relative age effect, individuals born in the first months of the same years stand out among their peers because they are physically ahead of their peers. As a result of this, they are selected by good teams and have the opportunity to train more qualifiedly, and their chances of becoming professional and being selected by national teams increase. On the other hand, the transition to elite sports environments proves more difficult for individuals born in the last months of the year (Helsen et al., 1998; Lemez et al., 2014). For this reason, the fact that the athletes born in the first months of the year and selected to the competitive teams get more training, better coaching, and more opportunities to play more matches will lead to talented, and potential young athletes born in the last months of the same year to being overlooked, lost or taking a dislike to sports in the scope of long-term athlete development (Baker et al., 2010).

RAE was studied in team and individual sports such as ice hockey (Pelletier & Lemoyne, 2022; Smith & Weir, 2013), basketball (Beşer, 2022; Ibanez et al., 2018; Yapar, 2020), football (Genç, 2019; Padrón-Cabo et al., 2016), rugby (Cobley et al., 2014; Lemez et al., 2016), swimming (Costa et al., 2013; Düzgün et al., 2022), tennis (Gerdin et al., 2018; Ulbricht et al., 2015) and skiing (Müller et al., 2015; Romann & Fuchslocher, 2014). The findings show that the presence of the relative age effect is seen in both individual and team sports.

There is no study in the literature that examines the relative age effect in all the Turkish professional football leagues, which thus makes this paper an original study. All in all, this study was carried out to examine the existence of the relative age effect among the football players in Turkish professional leagues according to their birth years and the positions they played. This study aims to examine the existence of the relative age effect among the football players in Turkish professional leagues according to their birth years and the positions they played.

METHODS

Research Model

In this study, scanning model was used. The type of research is quantitative and retrospective.

Study Group

All the professional football players from the football clubs of Super League, Spor Toto 1st League, 2nd League and 3rd League participated in the study. A total of 3622 professional football players participated in the study, including 20 clubs and 624 footballers from the Super League, 19 clubs and 555 footballers from the 1st league, 38 clubs and 1018 footballers from the 2nd league, and 55 clubs and 1425 footballers from the 3rd league. The participants were classified as goalkeeper, wing-back, central defender, wing forward, striker, central midfielder, and relative age effect was also studied based on the positions they played. In order to reveal the Relative Age Effect, the participants were divided into 4 quarters with 3-month intervals and 2 half-terms with 6-month intervals according to their birth months. First quarter covers “January, February, March”, second quarter “April, May, June”, third quarter “July, August, September”, fourth quarter “October, November, December”, and first six months cover “January, February, March, April, May, June”, the second six months “July, August, September, October, November, December”.

Research Ethics

"Ethics Commission Committee Report" dated 24.06.2022 and numbered 34/11 was received from Yozgat Bozok University Ethics Commission Board for the realization of the research.

Data Collection

The data of the study were retrieved from the official website of the Turkish Football Federation (TFF, 2022) and Transfermarkt web page (Transfermarkt, 2022). In the research the data of the second half of the 2021-2022 football season were used.

Data Analysis

The distributions of the football players according to birth months, positions and leagues were presented separately, and the frequency distribution differences between the groups were revealed by the chi-square test. The results obtained regarding birth months and positions of the athletes are presented in tables and figures. SPSS 22 statistical package program was used to analyze the data and the significance level was accepted as $p=0.05$.

FINDINGS

This section provides the findings as a result of the statistical analysis of the obtained data.

Table 1. Number of clubs and football players by league

Leagues	Number of Clubs (%)	Number of Footballers (%)
Turkish Super League	20 (15,15%)	624 (17,23%)
Spor Toto 1st League	19 (14,39%)	555 (15,32%)
TFF 2nd League	38 (28,79%)	1018 (28,11%)
TFF 3rd League	55 (41,67%)	1425 (39,34%)
Total	132 (100%)	3622 (100%)

Table 1 shows the numbers and percentages of all teams and football players in the Turkish professional leagues. A total of 3622 football players in all leagues were included in the study. Due to the league procedures, it is seen that the highest number of clubs and players are in the 3rd League, and the lowest number of clubs and players are in the Super League and 1st League.

Table 2. Analysis of frequency distributions of football players by their birth quarters (chi-square test)

Category	QTR1 (%)	QTR2 (%)	QTR3 (%)	QTR4 (%)	Total	X^2	p
Turkish Super League	204 (32,69%)	162 (25,96%)	143 (22,92%)	115 (18,43%)	624	26,859	0,000*
Spor Toto 1st League	179 (32,25%)	133 (23,96%)	141 (25,41%)	102 (18,38%)	555	21,685	0,000*
TFF 2nd League	400 (39,29%)	276 (27,11%)	203 (19,94%)	139 (13,65%)	1018	147,839	0,000*
TFF 3rd League	508 (35,65%)	391 (27,44%)	326 (22,88%)	200 (14,03%)	1425	139,129	0,000*
Total	1291 (35,64%)	962 (26,56%)	813 (22,45%)	556 (15,35%)	3622	311,992	0,000*

$p<0.05$*

In Table 2, the distribution of all football players in the Turkish professional leagues by quarter is given as numbers and percentages. Football players born in the first quarter of the year are higher in frequency and percentage than the players born in the other quarters of the year, and it is seen that those born in the 2nd quarter of the year are higher in frequency and percentage than the players born in the 3rd and 4th quarters (excluding the 1st league). According to the results of the chi-square test, the distribution values for the quarters of the year by birth months in all leagues were found statistically significant.

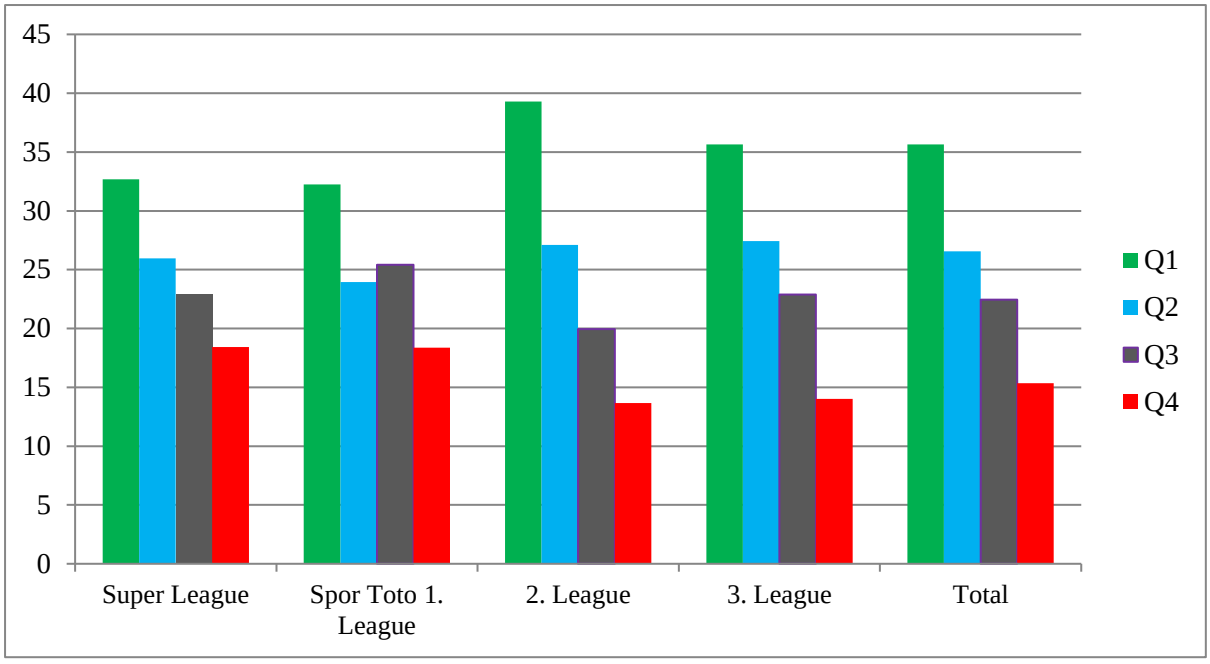

Figure 1. Percentages by the birth quarters

It is seen that the football players born in the first quarter are higher in percentage than the players born in the other quarters, and those born in the second quarter are higher than the players born in the 3rd and 4th quarters (except for the 1st league) (Figure 1).

Table 3. Frequency distribution of football players by the 6-month birth periods

Category	Half 1 (First 6 Months)	Half 2 (Second 6 Months)	Total
Turkish Super League	366 (58,65%)	258 (41,35%)	624
Spor Toto 1st League	312 (56,22%)	243 (43,78%)	555
TFF 2nd League	676 (66,40%)	342 (33,60%)	1018
TFF 3rd League	899 (63,09%)	526 (36,91%)	1425
Total	2253 (62,20%)	1369(37,80%)	3622

According to the leagues, the number of players born in the first 6 months of the year (January-February-March-April-May-June) is much higher than the number of players born in the last 6 months of the year (July-August-September-October-November-December) (Table 3).

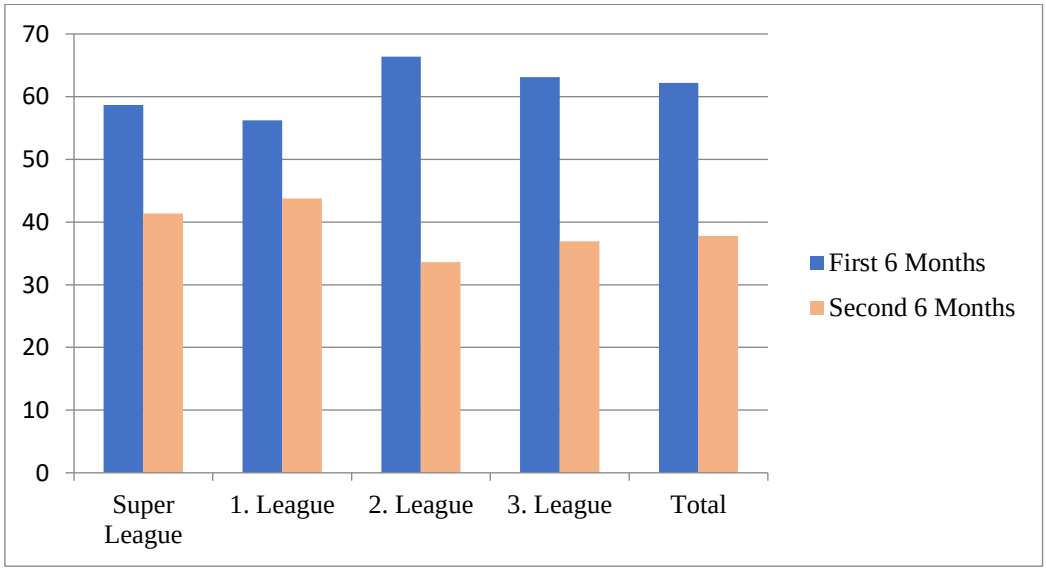

Figure 2. Percentages (%) by 6-month periods

According to leagues, the percentage of players born in the first 6 months of the year is higher than that of those born in the last 6 months of the year (Figure 2).

Table 4. Analysis of frequency distributions by positions (chi-square test)

League	Position	Q1 (%)	Q2 (%)	Q3 (%)	Q4 (%)	Total	X^2	p
Turkish Super League	Goalkeeper	18 (29,51%)	18 (29,51%)	16 (26,23%)	9 (14,75%)	61	3,590	0,309
	Wingback Player	28 (29,79%)	25 (26,60%)	22 (23,40%)	19 (20,21%)	94	1,915	0,590
	Central Defender	33 (32,04%)	31 (30,10%)	18 (17,47%)	21 (20,39%)	103	6,320	0,097
	Wing Striker	28 (26,41%)	24 (22,64%)	23 (21,70%)	31 (29,25%)	106	1,547	0,671
	Striker	26 (33,33%)	18 (23,08%)	20 (25,64%)	14 (17,95%)	78	3,846	0,279
	Central Midfielder	71 (39,01%)	46 (25,27%)	44 (24,18%)	21 (11,54%)	182	27,538	0,000*
Spor Toto 1st League	Goalkeeper	20 (35,71%)	15 (26,79%)	13 (23,21%)	8 (14,29%)	56	5,286	0,152
	Wingback Player	27 (32,14%)	15 (17,86%)	29 (34,52%)	13 (15,48%)	84	9,524	0,023*
	Central Defender	19 (22,62%)	24 (28,57%)	20 (23,81%)	21 (25%)	84	,667	0,881
	Wing Striker	30 (30,61%)	21 (21,43%)	25 (25,51%)	22 (22,45%)	98	2,000	0,572
	Striker	24 (35,82%)	19 (28,36%)	14 (20,90%)	10 (14,92%)	67	6,612	0,085
	Central Midfielder	59 (35,54%)	39 (23,49%)	40 (24,10%)	28 (16,87%)	166	11,976	0,007*
TFF 2nd League	Goalkeeper	43 (36,44%)	34 (28,81%)	19 (16,10%)	22 (18,64%)	118	12,508	0,006*
	Wingback Player	50 (32,68%)	48 (31,37%)	29 (18,95%)	26 (16,99%)	153	12,255	0,007*
	Central Defender	75 (46,01%)	38 (23,31%)	28 (17,18%)	22 (13,50%)	163	41,589	0,000*
	Wing Striker	61 (37,89%)	36 (22,36%)	39 (24,22%)	25 (15,53%)	161	16,963	0,001*
	Striker	44 (35,20%)	33 (26,40%)	30 (24%)	18 (14,40%)	125	10,968	0,012*
	Central Midfielder	127 (42,62%)	87 (29,19%)	58 (19,46%)	26 (8,72%)	298	74,322	0,000*
TFF 3rd League	Goalkeeper	72 (44,72%)	33 (20,50%)	36 (22,36%)	20 (12,42%)	161	36,988	0,000*
	Wingback Player	75 (34,25%)	65 (29,68%)	46 (21%)	33 (15,07%)	219	19,447	0,000*
	Central Defender	89 (40,27%)	58 (26,24%)	46 (20,81%)	28 (12,67%)	221	35,742	0,000*
	Wing Striker	83 (32,94%)	79 (31,35%)	60 (23,81%)	30 (11,90%)	252	27,841	0,000*
	Striker	56 (33,94%)	53 (32,12%)	31 (18,79)	25 (15,15%)	165	17,570	0,001*
	Central Midfielder	133 (32,68%)	103 (25,31%)	107 (26,29%)	64 (15,72%)	407	23,889	0,000*

$p<0.05$*

It was found the number of players born in the first quarter is higher than that of those born in the last quarter, and in many positions, the number of players born in the second quarter is higher than that of those in the third quarter, and the number of players born in the third quarter is higher than the number of players born in the fourth quarter. In addition, a statistically significant difference was found in favor of the players born in the first months of the year

among the central midfielders in the Turkish Super League, the wingbacks and central midfielders in the 1st league, and the players in all positions in the 2nd league and 3rd league ($p<0.05$), which indicates that relative age has an effect in professional Turkish leagues (Table 4).

DISCUSSION

This study was carried out to study the existence of the relative age effect among the professional Turkish League football players according to their birth years and the positions they played. When the research findings are examined, it is seen that the players born in the first quarter of the year in the Turkish Super League, Spor Toto 1st League, 2nd League and 3rd League are higher in frequency and percentage than the footballers born in the other quarters of the same year, and the number and percentage of those born in the 2nd quarter of the year is higher than that of those born in the 3rd and 4th quarters. Accordingly, the chi-square test ($p<0.05$) produced statistically significant results as to the distribution values of the football players in all leagues according to the quarters (Table 2).

It has also been determined that the number of players born in the first 6 months of the year in the Turkish professional leagues is considerably higher than the number of players born in the last 6 months of the league (Table 3). Similar results have been obtained in many studies on football In a study conducted in the Turkish Super League in the 2011-2012 season (Mulazımoğlu et al., 2013), the number of players in the First Team born in the first quarter of the year was quantitatively higher than that of those born in the other quarters, and in another study on Turkish 1st league (Mulazımoğlu et al., 2016), it was determined that 40% of the players in the First Team was born in the first quarter, and 14.72% in the last quarter. In other words, these studies reveal the existence of the relative age effect. In a study conducted on the last 8 teams in the 2012 European Football Championship (González-Víllora, 2015), it was determined that the football players born in the first quarter of the year were more in number than the players born in the last quarter, and in another study on Russian football (Bezuglov et al., 2019), it has been reported that the relative age effect is widely seen in all age groups of Russian football teams. In a study conducted with 408 professional teams (Super league, 1st league, 2nd league, 3rd league) and 8600 young football players (U14, U15, U16, U17, U19, U21) in Turkey (Köklü et al., 2017), it was found that football players were mostly in the first quarter were born. In the study conducted on 5201 football players in the Spanish Liga Santander, French Ligue 1, German Bundesliga, English Premier League, Italian Serie A, Belgium Eerste Klasse A, Turkish Super League, Austrian Bundesliga, Netherlands Eredivisie and Portugal Primeira Liga League in the 2016-2017 season (Yagüe et al., 2018), the number of football players born in the first quarter of the year (January-February-March) is 1641 (31.6%), and the number of footballers born in the last quarter of the year (October-November-December) is 977 (18.8%). A statistically significant difference was found between the groups of quarters. In another study (Pedersen et al., 2022) on male football players who participated in the under-17 World Cup between 1997-2019, the number of football players born in the first quarter of the same year was higher than the number of football players born in other quarters. In a study conducted in the Norwegian professional league in the 2007 season (Wiiuma et al., 2010), it was concluded that the number of players born in the first 6 months of the year was

considerably higher than the number of players born in the last 6 months of the league. All these results support our findings.

It has been determined that the number of football players born in the first months of the year is much higher in all positions (Goalkeeper, Wing-Back, Central Defender, Wing Striker, Striker, Central Midfielder). Again, a statistically significant difference was found in favor of the players born in the first months of the year among the central midfielders in the Turkish Super League, the wingback and central midfielders in the 1st league, and the players in all positions in the 2nd league and 3rd league ($p<0.05$). The presence of a relative age effect in professional leagues has been demonstrated (Table 4). In a study conducted with a total 2051 Chinese football players in the 13th National Chinese championship (Li et al., 2020), the number of U20 and U18 male football players was 241 (38.68%) born in the first quarter of the year, and the number of those born in the second quarter of the year was 124 (19.90%), the number of those born in the third quarter was 133 (21.35%), and the number of those born in the fourth quarter was 125 (20.06%). In the same study, the players were classified according to their positions -goalkeeper, central defender, midfielder and forward, and it was determined that the number of football players born in the first quarter was higher in all positions, and there was also a statistically significant difference between the groups. In another study conducted on male and female goalkeepers in the 2018 Brazilian football championship (De Souza et al., 2020), it was determined that the number of goalkeepers born in the first quarter was higher than the number of goalkeepers born in the second, third and fourth quarters of the same year. Another study was conducted on a total of 2430 football players in Spanish professional football league in 1999-2000, 2008-2009, 2009-2010, 2010-2011, 2011-2012 seasons (Salinero et al., 2014). In the seasons of 2008-2009, 2009-2010, 2010- 2011, 2011-2012, no statistically significant difference was found among strikers and goalkeepers based on the quarters they were born in, while a statistically significant difference was found among the defenders (the number of players born in the first quarter of the specified seasons is higher) and the midfielders (the number of players born in the second quarter is higher in the 2009-2010, 2010-2011 seasons, and the number of players born in the first quarter is higher in 2008-2009, 2011-2012 seasons). In the 1999-2000 season, no statistically significant difference was found in all positions according to the quarters. While some of the findings in this study support our findings, some do not. In another study (Salinero et al., 2013) conducted on 2763 professional football players in 5 European leagues (Italy, Germany, France, Spain, United Kingdom) in the 2009-2010 season, it was reported that the majority of the goalkeepers, central defenders, central midfielder and forward players was born in the first or second quarter of the year. In a study conducted on 5748 football players in Spanish professional football (first division, second division, national teams) in the 2011-2016 season (López-del-Río et al., 2019), the players were classified according to their positions as goalkeepers, central defenders, fullbacks, central midfielders, wing forwards and strikers. According to the results, it has been observed that the number of football players born in the first quarter of the year is higher in all leagues and in all positions. It is safe to state that many research results in the literature are in line with our findings.

CONCLUSION AND RECOMMENDATIONS

The results obtained in our study are similar to the findings in the literature. In our study, the presence of RAE among players in Turkish professional leagues has been revealed and it has been determined that the number of players born in the first quarter of the year is much higher. It has also been observed that being born in the early months of the year has a high level of importance to be selected for the team or take part in the team. In parallel with the findings obtained from our study and the literature, coaches, families, sports scientists, sports federations should consider RAE in the talent selection. The Turkish Football Federation (TFF) can minimize RAE by planning the categories in quarters or half-years in infrastructure, thus preventing the loss of players born in the last months of the year. In addition, in order to minimize RAE in sports, it may be recommended to group the age categories by taking into account the birth quarters or six-month periods of the year when planning national or international sports competitions as well as child and youth talent selection.

Conflicts of Interest: The authors declare that they have no conflict of interest.

Authors' Contribution: All two authors have made a substantial and intellectual contribution to the study and approved it for publication.

Research Ethics Informations:
Ethics Committee: Yozgat Bozok University Ethics Commission
Date: 24.06. 2022
Decision No: 34/11

REFERENCES

Akkoç, O., & Göksu, Ö.C. (2020). The effect of relative age on the abilites and athletic performance of soccer players under the age of 15. *Spormetre The Journal of Physical Education and Sport Sciences*, *18*(4), 203-212. https://doi.org/10.33689/spormetre.595075

Baker, J., Schorer, J., & Cobley, S. (2010). Relative age effects. *Sportwiss*, *40*(1),26-30. https://doi.org/10.1007/s12662-009-0095-2

Barnsley, P.E., Barnsley, R.H., & Thompson, A.H. (2020). *Relative age effects in sport*: *International perspectives*. Routledge

Beser, E. (2022). *Relationship with Turkish womens basketball super league players's relative age effect and game performance*. Master's Thesis, Istanbul University, Cerrahpaşa Graduate School of Education Department of Movement and Training Sciences, İstanbul.

Bezuglov, E.N., Nikolaidis, P.T., Khaitin, V., Usmanova, E., Luibushkina, A., Repetiuk, A., Waskiewicz, Z., Gerasimuk, D., Rosemann, T., & Knechtle, B. (2019). Prevalence of relative age effect in Russian soccer: The role of chronological age and performance. *International Journal of Environmental Research and Public Health, 16* (21),1-10. https://doi.org/10.3390/ijerph16214055

Bompa, T.O., & Carrera, M. (2015). *Conditioning young athletes.* Human Kinetics.

Cobley, S., Hanratty, M., O'Connor, D., & Cotton, W. (2014) First club location and relative age as influences on being a professional Australian rugby league player. *Int J Sports Sci Coach*, *9*(2),335–46. https://doi.org/10.1260/1747-9541.9.2.335

Costa, A.M., Marques, M.C., Louro, H., Ferreira, S.S., & Marinho, D.A. (2013). The relative age effect among elite youth competitive swimmers. *Eur J Sport Sci*., *13*(5),437-4. https://doi.org/10.1080/17461391.2012.742571

De Souza, L.S., Vicentini, L., Morbi, M.D.R., & Marques, R.F.R. (2020). The relatıve age effect on soccer goalkeeper traınıng ın Brazıl: scenarıos of the male and female elıtes. *Journal of Physical Education*, *31*(1), 3173. https://doi.org/10.4025/jphyseduc.v31i1.3173

Düzgün, M., Göksu, Ö. C., & Akkoç, O. (2022). Relative age effect on swimmers. *Spormetre The Journal of Physical Education and Sport Sciences*, *20*(1),82-91. https://doi.org/10.33689/spormetre.984057

Genç, H. (2019). Türkiye A Milli takımlarında bağıl yaş etkisinin branşlar açısından incelenmesi. Öztürk, A., Karaçar, E., Yılmaz, O. (Ed.), *Spor ve rekreasyon araştırmaları kitabı-2*. (s. 177-187). Çizgi Kitabevi.

Gerdin, G., Hedberg, M., & Hageskog, C. A. (2018). Relative age effect in Swedish male and female tennis players born in 1998–2001. *Sports, 6*(2),1-12. https://doi.org/10.3390/sports6020038

González-Víllora, S., Pastor-Vicedo, J.C., & Cordente, D. (2015). Relative age effect in UEFA championship soccer players. *Journal of Human Kinetics*, *47*, 237-248. https://doi.org/10.1515/hukin-2015-0079

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*(6), 791–798. https://doi.org/10.1002/(SICI)1520-6300(1998)10:6<791::AID-AJHB10>3.0.CO;2-1

Huard Pelletier, V., & Lemoyne, J. (2022). Early sport specialization and relative age effect: prevalence and influence on perceived competence in ice hockey players. *Sports*, *10*(4), 1-11, Article 62. https://doi.org/10.3390/sports10040062

Ibanez, S.J., Mazo, A., Nascimento, J., & Garcia-Rubio. J. (2018). The relative age effect in under-18 basketball: effects on performance according to playing position. *PLoS ONE, 13*(7), 1-11. Article e0200408. https://doi.org/10.1371/journal.pone.0200408

Köklü, Y., Arslan, Y., & Alemdaroğlu, U. (2017). Evidence of the relative age effect in youth soccer players from Turkey. *Kinesiologia Slovenica*, *23*(2), 33–43.

Lemez, S., Baker, J., Horton, S., Wattie, N., & Weir, P. (2014). Examining the relationship between relative age, competition level, and dropout rates in male youth ice-hockey players. *Scandinavian Journal of Medicine and Science in Sports*, *24*(6), 935–942. https://doi.org/10.1111/sms.12127

Lemez, S., Macmahon, C., & Weir P. (2016). Relative age effects in women's rugby union from developmental leagues to World Cup tournaments. *Res Q Exerc Sport*, *87*(1), 59–67. https://doi.org/10.1080/02701367.2015.1116120.

Li, Z., Mao, L., Steingröver, C., Wattie, N., Baker, J., Schorer, J., & Helsen, W.F. (2020). Relative age effects in elite Chinese soccer players: Implications of the 'one-child' policy. *PLoS ONE, 15*(2), e0228611. https://doi.org/10.1371/journal.pone.0228611

López-del-Río, M., Rabadán, D., Redondo, J.C., & Sedano, S. (2019). Relative age effect in professional football: ınfluence of competitive level and playing position. Apunts. *Educació Física i Esports, 35*(138), 26-39. https://dx.doi.org/10.5672/apunts.2014-0983.es.(2019/4).138.02

Mujika, I., Vaeyens, R., Matthys, S.P.J., Santisteban, J., Goiriena, J., & Philippaerts, R. (2009). The relative age effect in a professional football club setting. *Journal of Sports Sciences, 27*(11), 1153-1158. https://dx.doi.org/10.1080/02640410903220328

Mülazımoğlu, O., Bayansalduz, M., Kaynak, K., & Mulazımoglu, H.D. (2016). Relative age effect in Turkish soccer. Turkish Journal of Sport and Exercise, *18* (1), 64-69. https://dx.doi.org/10.15314/tjse.14670

Mülazımoğlu, O., Cihan, H., Erdoğdu, M., & Şirin, E.F. (2013). The relative age effect in professional and youth teams of some Turkish soccer clubs. *Spormetre The Journal of Physical Education and Sport Sciences, 11*(2), 105-111. https://dx.doi.org/10.1501/Sporm_0000000244

Müller, L., Müller, E., Kornexl, E., & Raschner, C. (2015) The relationship between physical motor skills, gender and relative age effects in young Austrian alpine ski racers. *Int J Sports Sci Coach*, *10*(1), 69–85. https://doi.org/10.1260/1747-9541.10.1.69

Padrón-Cabo, A., Rey, E., García-Soidán, J.L., & Penedo-Jamardo, E. (2016). Large scale analysis of relative age effect on professional soccer players in FIFA designated zones. *International Journal of Performance Analysis in Sport*, *15*(1), 332-346. https://doi.org/10.1080/24748668.2016.11868890

Pedersen, A.V., Aune, T.K., Dalen, T., & Lorås, H. (2022). Variations in the relative age effect with age and sex, and over time—Elite-level data from international soccer world cups. *PLoS ONE, 17*(4),e0264813. https://doi.org/10.1371/journal.pone.0264813

Romann, M., & Fuchslocher, J. (2014). Survival and success of the relatively oldest in Swiss youth skiing competition. *Int J Sports Sci Coach*, *9*(2),347–56. https://doi.org/10.1260/1747-9541.9.2.347

Salinero, J.J., Pérez, B., Burillo, P., Lesma, M.L., & Herrero, M.H. (2014). Efecto de edad relativa en el fútbol profesional español / Relative age effect in spanish professional football. *Revista Internacional de Medicina y Ciencias de la Actividad Física y el Deporte*, *14*(56), 591-601.

Salinero, J.J., Pérez, B., Burillo, P., & Lesma, M.L. (2013). Relative age effect in European professional football analysis by position. *J. Hum. Sport Exerc.*, *8*(4), 966-973. https://doi.org/10.4100/jhse.2013.84.07

Smith, K.L., & Weir, P.L. (2013). An examination of the relative age effect in developmental girls' hockey in Ontario. *High Abil Stud*., *24*(2),171–84. https://doi.org/10.1080/13598139.2013.847357

T.F.F. (2022, May 10). *Home page*. https://www.tff.org/Default.aspx?pageId=200&ftxtId=37028.

Transfermarkt (2022, May 11). *Matches*. https://www.transfermarkt.com.tr/.

Ulbricht, A., Fernandez-Fernandez, J., Mendez-Villanueva, A., & Ferrauti, A. (2015). The relative age effect and physical fitness characteristics in German male tennis players. *Journal of Sports Science and Medicine, 14*(3),634-642.

Wattie, N., Schorer, J. & Baker, J. (2015). The relative age effect in sport: developmental systems model. *Sports Medicine, 45*(1), 83-94. https://doi.org/10.1007/s40279-014-0248-9.

Wiiuma, N., Liea, S.A., Ommundsenb, Y., & Enksena, H.R. (2010). Does relative age effect exist among Norwegian professional soccer players?. *International Journal of Applied Sports Sciences*, *22*(2), 66-76. http://dx.doi.org/10.24985/ijass.2010.22.2.66

Yagüe, J.M., Rubia, A., Sánchez-Molina, J., Maroto-Izquierdo, S., & Molinero, O. (2018). The relative age effect in the 10 best leagues of male professional football of the union of European football associations (UEFA). *Journal of Sports Science and Medicine*, *17*(3), 409-416.

Yapar, A. (2020). Examination of birthplace and relative age effect on basketball players participating in U16 basketball European championship. *Çanakkale Onsekiz Mart University Journal of Sport Sciences*, *3*(3), 63-79.