Journal of Physical Education and Sport ® (JPES), 18(3), Art 213, pp. 1439 - 1444, 2018
online ISSN: 2247 - 806X; p-ISSN: 2247 – 8051; ISSN - L = 2247 - 8051 © JPES

Original Article

An investigation of Danish male youth football – is something rotten in the state of Denmark?

KNUD RYOM[1], NIELS NYGAARD ROSSING[2], ALEXANDER FLATTUM[1], DAN STIEPER KARBING[2]
1 Aarhus University, Department of Public Health, DENMARK
2 Aalborg University, Department of Health Science and Technology, DENMARK

Published online: September 30, 2018
(Accepted for publication July 17, 2018)
DOI:10.7752/jpes.2018.03213

Abstract:
Objective: The purpose of this study was to investigate the presence of relative age effect (RAE) in youth football in Denmark. RAE is a well-established phenomenon in elite sports across the globe and has been heavily investigated in football, often across clubs and countries. Method: To investigate RAE in Denmark, samples were collected from recreational and all levels of youth elite level male football. Chi-squared tests were applied to determine if RAE was present. Results: Results indicate that RAE is present in Danish male recreational football ($P = 0.018$) and all levels of youth elite football ($P \leq 0.005$). Tendencies towards RAE at elite adult level (national team) were found, but results were not significant ($P = 0.227$). Collectively, this study illustrates the varied impact of RAE on different levels of seniority and competition, highlighting necessity of looking at RAE on different levels to encompass the importance of the phenomenon. Furthermore, the findings of this study indicate that despite of the Scandinavian focus on both mass participation and elite, RAE is still a common phenomenon at all levels of participation.
Key words: relative age effect (RAE), elite football, youth elite football, talent identification and development.

Introduction

Talent identification and talent selection both play a vital role in the pursuit of excellence in football [1]. However, football also represents one of the most competitive and complex sports for reaching expertise [2], which makes talent identification in football particularly difficult. In addition, the game of football is a global phenomenon, like no other in sports, and the recruitment and selection for elite level are thus one of the toughest in modern sport [3-4].

One of the most examined phenomena in talent identification in sport throughout the last two decades is the relative age effect (RAE) [5-6]. RAE has been documented across sports in youth and adult elite levels in a wide range of countries [7-13]. However, RAE has not been heavily investigated in the Nordic countries, countries that generally are characterised as strong welfare states with a large voluntary involvement in sport [14]. An interesting common feature of the Scandinavian countries are a distinct focus on both mass participation and elite, unique to other European countries, which make Scandinavia an interesting context to investigate in regard to RAE. Furthermore, RAE in general are often investigated between clubs, across countries and within elite adult or elite youth sample, but seldom investigated at different levels within the talent development system.

The predominant explanation of RAE is that coaches and scouts 'confuse' maturation with talent, also known as the maturation-hypothesis [15]. This hypothesis assumes that in the earlier stages of talent development relatively older players (birth date in the 1st quarter of the sport's cohort) benefit from an advanced physical and cognitive maturity compared to their younger peers [15-16].

Some empirical evidence suggests that RAE can occur in the entry of sports participation [17-18], while several studies have found RAE to occur in the selection of youth players for higher competitive levels [19-21]. However, researchers have found that RAE diminishes at elite level in some team sports such as handball [6]. To our knowledge, no studies have investigated this diminishing tendency nor has it been associated with professional football.

Thus, the purpose of this study was to investigate the relative age effect in the progression from junior to senior level in samples of Danish male football players. Since investigations of the progression between age groups in youth football are (as previously noted) rare, such a study could provide a more detailed knowledge of a complex phenomenon. Combined with an investigation in a less researched football culture in Europe, characterized by high degrees of voluntary involvement and equal focus on both mass participation and elite football, provides this study with new dimensions concerning RAE.

The Danish football system

As already, mentioned, the Danish sport structure generally attempts to balance mass participation and elite sport development [22]. As other Scandinavian sports, Football in Denmark is traditionally a voluntary

Corresponding Author: KNUD RYOM, E-mail: knudryom@ph.au.dk

activity with a so-called heterarchical organizational structure, where several key factors such as local clubs, professional clubs and volunteers function highly autonomously and initiate their main efforts on their own [14]. Approximately 1100 recreational clubs exist within Danish organized football, players from some of these clubs eventually get identified and recruited for talent clubs (described later) often feeding professional clubs talent development systems.

Volunteerism and non-trained coaches often characterize coaching staff in local and recreational football clubs. Moreover, almost all communities across the country have a football field nearby, making football present throughout Denmark. Thus, football is among the most popular and successful sports in Denmark in terms of youth sport participation (in particular males) and media coverage [23].

The talent development system in Danish youth football is based on clubs applying for a license from the national federation (Danish FA) to be identified as a "talent club". Danish FA (commonly known as DBU) is the governing body of all football in Denmark. It organises the Danish football clubs and runs the professional Danish football leagues (Superliga) and the men and women's national teams at all age groups. Danish FA has divided the talent club licenses into three hierarchical categories, A- (12 clubs) and B- (14 clubs) and T-license (13 clubs) with the A-license representing the highest ranked level. The national federation has licensing requirements for both material and human resources such as the quality of the club's sport facilities and the number of educated coaches. The clubs with A-license approval, or the talent clubs, receive extra economic resources, and their U-17 and U-19 teams are admitted to the highest youth leagues in Denmark.

Methods

Samples

Five samples were collected in the Danish football system. The samples are intended to investigate each potential step in the Danish talent development system in male football, starting from lowest level (recreational) reaching highest possible national level (the national team). Since the Danish talent development in football generally intensifies at age 14, this study made this age group its starting point and ending when reaching adult status. Each of the five samples are described below.

Sample 1: The first sample consisted of football players' information (anonymized ID, birth date, club, competitive level and number of matches played) included in an overall sample, representing boys born in the year 2000 playing in the Danish FA's tournaments (n = 12,492). These data were collected from the Danish FA player database in 2014 dating the players 14-15 years of age. The majority of these players represent boys involved in recreational football activities.

Sample 2: A small number of players regarded as talents (identified based on competition level) were singled out in a subset from sample 1. This smaller sample was consisting of boys born in 2000 (n = 604) categorized as playing in licensed talent elite clubs (A-license) at the highest competitive Danish national youth level U15 (under 15 years).

Sample 3: A subset of sample 2 was created in order to further investigate Danish youth elite football. This sample was a minor group (n = 54) of boys selected from sample 2 representing players selected by the Danish FA to regularly train at talent centres around Denmark. These players are considered in their age group, the pre-roster for the U-16 national team. The purpose was to study the absolute elite level of Danish boys at U15 cohort. This sample was collected through Danish FA roster from talent centres listing players selected in 2013 and born 2000. These data were gathered through Danish FA's team sheets and player information derived from sample 2.

Sample 4: The first three samples have primarily focused on the initial phase of talent identification and development. The talent development system in Denmark generally finalizes at age 22 when players are not permitted to play at U21 level anymore. Accordingly, to investigate the overall talent development system, elite players of age 14-22 years were included. In order to do so an overall sample of the highest national competitive level of youth football for Danish boys were collected (in 2013) from Danish FA's youth national teams (U16-U17-U18-U19-U21). These data represent all players (n = 85) selected for the youth Danish National teams in 2013 and is included to look at this group of players collectively despite age differences.

Sample 5: The four previous samples investigate the Danish youth system, recreational to elite level. The fifth sample represents competitive national adults allowing a comparison of youth and adult competitive levels. This sample was collected through public data (www.dbu.dk) with information from Denmark's national team players born in the years 1980-1995 (n = 113).

Collectively all samples aimed to provide an overview of the Danish talent development and elite football system from initial to final stage of mastery.

Measures

Categorization

In order to determine the possible existence of RAE in Danish youth football, the birth quartile of each player was registered. Danish youth football at all performance levels is organized from January 1 to December 31. Thus, Q1 = January – March; Q2 = April – June; Q3 = July – September; and Q4 = October – December. This categorization was used for all of the study samples.

Data analysis

A Chi-squared test was used to evaluate whether players in all samples were distributed unevenly across birth quarters, this signifying a RAE in the sample. The Chi-squared test was performed by comparing the observed frequency of players in the four birth quarters with the expected frequencies of an even frequency of players in each birth quarter. A statistical significance level of $p < 0.05$ was used to determine if distributions were significantly uneven and thus indicating a RAE.

Results

An overview of the samples and analysis (numbers, percentages, chi-squared and p-values) can be found in table 1. Fig. 1 graphically features the quartile distributions of players in all five samples. Results from table 1 identify that RAE can be detected at elite youth level across samples (2, 3 & 4) when investigating based on quartiles. Footballers playing recreational level (sample 1) were also affected by RAE (P = 0.018), but to a smaller extent than the elite samples yet still significant. Chi-Squared test analysis highlighted a significant uneven distribution in Danish elite youth teams for the whole country (P = 0.001). Furthermore, an uneven distribution was found at the national talent centres, at U15 level (P = 0.002) and at all national youth teams ranging from U16 to U21 (P = 0.001). However, significant uneven distribution was not found at the adult national team (P = 0.227). This result might be due to a smaller sample size, as the graphical display of the distribution (fig. 1), indicates a tendency towards RAE in this sample as well. These results demonstrate that RAE is prevalent in the Danish talent development system and recreational football, with a distribution indicating RAE although not significant at adult national elite level.

Table 1: Relative age effect across samples in Denmark
(N = total in sample; Q = quartile, $\chi 2$ = chi-squared, P = p-value).

Sample	Skill level	N	Q1 (%)	Q2 (%)	Q3 (%)	Q4 (%)	$\chi 2$	P
1	Recreational (U15)	12,492	25.99	25.34	24.47	24.20	10.09	0.018
2	Youth elite (U15)	604	36.26	32.78	19.37	11.59	96.36	<0.001
3	Youth national elite (U15)	54	37.04	38.89	14.81	9.26	14.89	0.002
4	Youth national teams (U16 => U21)	85	38.82	24.71	28.24	8.24	16.41	<0.001
5	Adult national team	113	30.97	27.43	23.89	17.70	4.35	0.227

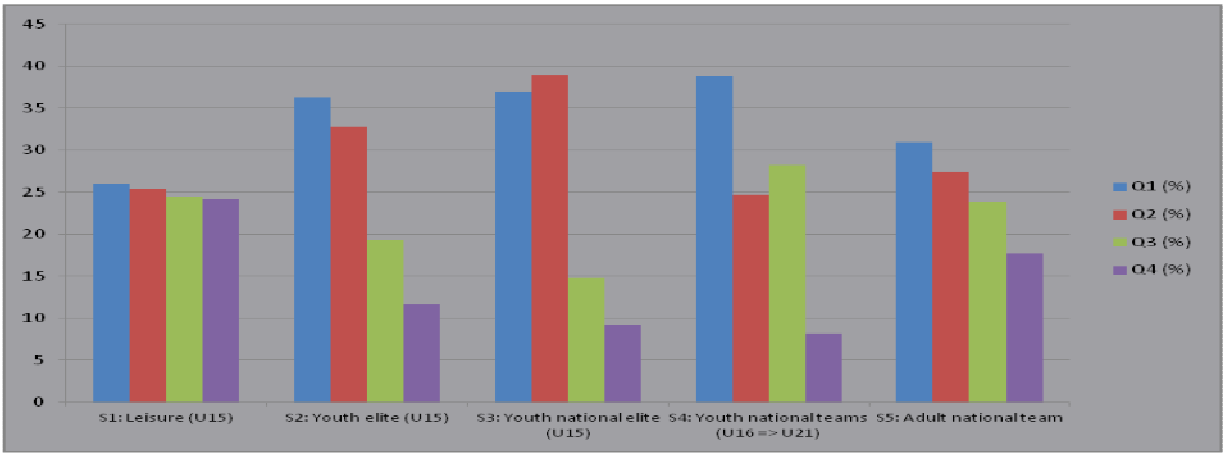

Fig. 1. Quartile distributions of players across samples and percentages. Q = quartile, S = sample.

A clearly uneven percentage per birth quarter can be seen for some of the samples (2, 3 & 4) in fig. 1. This uneven distribution of players is represented by a high percentage in the first two quarters of the year when looking at players born in 2000 competing at elite level (sample 2) or included in talent centres (sample 3). This tendency was also found in sample 4 where youth national teams at other ages (U16 => U21) were included. Despite the chi-squared analysis yielding a $p < 0.05$ signifying significant RAE for boys playing recreational football (sample 1), the effect is less pronounced compared to that observed in the smaller more elite samples.

We found no significant RAE in the Danish adult national team (sample 5) (P = 0.227), and despite relatively older players remained predominant, the tendency was significantly less pronounced compared to less elite levels except for recreational youth football. Such results are congruent with other studies [24-26].

Discussion

The main purpose of this study was to investigate the distribution of the relative age effect in a sample of Danish male youth and senior national football players. Objectives were to investigate the distribution of birth dates into quartiles in both youth and senior players across different competitive levels. Thus, this study investigated the relative age effect in the progression from junior to senior level in samples of Danish male football players. Findings revealed that RAE was shown in recreational football, while it was more pronounced in elite youth football. Despite relatively older players are still favoured at elite adult level (fig. 1), the effect was less pronounced, which in combination with the smaller sample size resulted in a statistically non-significant RAE.

In this study, RAE has been examined at recreational and competitive levels of youth and adults in a Danish context. Collectively, this study illustrates the necessity of looking at RAE on different levels of seniority and competition to clarify the complexity of the phenomenon as suggested by Gibbs et al. [24].

The first main finding showed that RAE was significantly present in recreational youth football (U15), but not to the same extent as elite youth football. This finding is aligned with pioneer research pointing towards RAE at all levels of competition in ice hockey [27-29] and more recent results in football [8, 11, 30]. However, this result could also be due to a very large sample size (N = 12,492), hence the results should be interpreted with caution. Nevertheless, the results show that RAE occur at both mass participation level and elite level. Since the majority of coaching staff in Danish recreational football are characterised as volunteers and non-educated coaches, the results indicate that maturation 'confusion' seems to occur across recreational and elite youth levels and across coaches' education and the context.

Our second finding from investigating elite youth level in Danish football was that RAE was evident in youth elite (U15), youth national elite (U15) and youth national teams (U16 up to U21). Such results are consistent with other findings in football [3-4] and similar team sports like baseball [31], basketball [32], handball [15], ice hockey [33-34] and rugby [25, 26, 35].

The third finding was a non-significant presence of RAE when investigating the adult national football team in Denmark. This finding could suggest a fading tendency of RAE at adult national level. A similar fading tendency of RAE at adult national level has also previously been found in handball [36] and other sports at the elite level [6]. The small sample size, however, is a limitation of this sample and may at least in part explain why no significant RAE was indicated by the chi-squared analysis. The non-significant finding could imply a need for further investigating successful adult national football players based on quartiles. Leaving aside the statistical insignificance of the adult national football sample and looking at the skewness in distribution represented in fig. 1, the skewness markedly changes between youth elite level and tend to 'normalize' at adult elite level. The 'normalization' at adult level have been termed as 'the underdog effect' [24, 37], referring to the hypothesis that fourth quartile players, benefit from being underdogs during their development years, and therefore have greater success in progressing through the final levels of talent development. Some researchers even suggest that these players are more successful in their career span (e.g. wages and injury rate) [37].

In Cobley & colleagues' meta-analysis of RAE in sport, they argue that national talent identification and development systems might ironically be counterproductive in terms of finding and developing talents or gifted athletes [6]. Their claim was that such talent systems might result in an unforeseen opposite effect by draining the total talent pool through early talent selection and RAE. Results from this study show that RAE are present at all level of football in Denmark, suggesting that the loss of football players not only regards talent development, but also recreational level football.

Conclusion

The present study identified the significance of being born in different birth quartiles of the year across recreational and competitive levels of different age groups in Danish youth football. Our analysis showed similar results as previous studies, reporting a RAE at different elite competitive levels in Danish youth football and to a minor degree recreational youth football. At the highest adult competitive level, we found a fading tendency of RAE, as illustrated by a non-significant and less skewed distribution of players than lower competitive levels.

A call for future research

Our study, together with similar studies, has pointed towards a fading tendency of RAE at adult national level. Studies in other sports like Ice hockey, Rugby and Cricket suggest that this effect go even further [24, 26]. These studies indicate that the so-called underdog effect may occur, with players born relative lately seem to have longitudinal benefits compared to their relative older peers. Including the knowledge of more recent studies showing that the relatively youngest players had longer careers [24], higher salaries (Ashworth & Heyndels, 2007), and lesser injury rates than relatively older athletes [39-40]. The results of this study are limited in this regard; hence, we need further knowledge of the phenomenon of late bloomers or so-called underdogs in football

to expand the understanding of RAE. This calls for further investigations both at recreational level and at how relative age effect is associated with the elite junior to senior transition.

References

[1] Reilly, T., Williams, A. M., Nevill, A., & Franks, A. (2000). A multidisciplinary approach to talent identification in soccer. Journal of sports sciences, 18(9), 695-702.
[2] Aguiar, M., Botelho, G., Lago, C., Maças, V., & Sampaio, J. (2012). A review on the effects of soccer small-sided games. Journal of human kinetics, 33, 103-113.
[3] Haugaasen, M. & Jordet, G. (2012). Developing football expertise: a football-specific research review, International Review of Sport and Exercise Psychology, 5(2), 177-201.
[4] Güllich, A. (2014). Selection, de-selection and progression in German football talent promotion, European Journal of Sport Science, 14(6), 530-537.
[5] 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(2), 147-167.
[6] 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(3), 235-256.
[7] Stebelsky, R. H. B. G. (1991). "Born to play ball" The relative age effect and Major League Baseball. Sociology of Sport Journal, 8, 146-151.
[8] 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.
[9] 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(1), 54-64.
[10] Hoare, D. (2000). Birthdate and basketball success: Is there a relative age effect. Paper presented at the Proceedings of the Pre-Olympic Congress: Sports Medicine and Physical Education International Congress on Sports Science.
[11] Helsen, W. F., Van Winckel, J., & Williams, A. M. (2005). The relative age effect in youth soccer across Europe. Journal of Sports Sciences, 23(6), 629-636.
[12] Wattie, N., Baker, J., Cobley, S., & Montelpare, W. J. (2007). A historical examination of relative age effects in Canadian hockey players. International Journal of Sport Psychology, 38(2), 178-186.
[13] 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.
[14] Bjørndal, C.H. Ronglan, L.T. & Andersen, S.S. (2017). Talent development as an ecology of games: a case study of Norwegian handball, Sport, Education and Society, 22(7), 864-877.
[15] Schorer, J., Wattie, N., & Baker, J. R. (2013). A New Dimension to Relative Age Effects: Constant Year Effects in German Youth Handball. Plos One, 8(4).
[16] Malina, R. M., Bouchard, C., & Bar-Or, O. (2004). Growth, maturation, and physical activity: Human Kinetics.
[17] Delorme, N., Boiche, J., & Raspaud, M. (2010). Relative age and dropout in French male soccer. Journal of Sports Sciences, 28(7), 717-722.
[18] 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 & Science in Sports, 24(6), 935-942.
[19] Augste, C. & Lames, M. (2011). The relative age effect and success in German elite U-17 soccer teams. Journal of Sports Sciences, 29(9), 983-987.
[20] Gil, S.M., Badiola, A. Bidaurrazaga-Letona, I., Zabala-Lili, J., Gravina, L., Santos-Concejero, J., Lekue, J.A. & Granados, C. (2014). Relationship between the relative age effect and anthropometry, maturity and performance in young soccer players. Journal of Sports Sciences, 32(5), 479-486.
[21] Sæther, S.A. (2015). Selecting players for youth national teams - a question of birth month and reselection? Science and Sports, 30, 314-320.
[22] Ibsen, B. & Seippel, Ø. (2010). Voluntary organized sport in Denmark and Norway , Sport in Society, 13(4), 593-608.
[23] Storm, L., Henriksen, K., & Christensen, M. K. (2012). Specialization pathways among Danish elite athletes: A look at the developmental model of sport participation from a cultural perspective. International journal of sport psychology, 43(3), 199-222.
[24] Gibbs, B. G., Jarvis, J. A., & Dufur, M. J. (2011). The rise of the underdog? The relative age effect reversal among Canadian-born NHL hockey players: A reply to Nolan and Howell. International Review for the Sociology of Sport, 47(5), 644-649.
[25] McCarthy, N., & Collins, D. (2014). Initial identification & selection bias versus the eventual confirmation of talent: evidence for the benefits of a rocky road? Journal of Sports Sciences, 32(17), 1604-1610.
[26] McCarthy, N., Collins, D., & Court, D. (2016). Start hard, finish better: further evidence for the reversal of the RAE advantage. Journal of Sports Sciences, 34(15), 1461-1465.

[27] Barnsley, R. H., Thompson, A. H., & Barnsley, P. E. (1985). Hockey success and birthdate: The relative age effect.Ashworth, J., & Heyndels, B. (2007). Selection bias and peer effects in team sports - The effect of age grouping on earnings of German soccer players. Journal of Sports Economics, 8(4), 355-377.
[28] Barnsley, R. H., & Thompson, A. H. (1988). Birthdate and success in minor hoceky - the key to the NHL. Canadian Journal of Behavioural Science-Revue Canadienne Des Sciences Du Comportement, 20(2), 167-176.
[29] Barnsley, R. H., Thompson, A., & Legault, P. (1992). Family planning: Football style. The relative age effect in football. International Review for the Sociology of Sport, 27(1), 77-87.
[30] Jimenez, I. P., & Pain, M. T. G. (2008). Relative age effect in Spanish association football: Its extent and implications for wasted potential. Journal of Sports Sciences, 26(10), 995-1003.
[31] Thompson, A.H., Barnsley, R.H., & Stebelsky, G. (1991). Born to play ball - the relative age effect and major-league baseball. Sociology of Sport Journal, 8(2), 146-151.
[32] Delorme, N., & Raspaud, M. (2009). The relative age effect in young French basketball players: a study on the whole population. Scandinavian Journal of Medicine & Science in Sports, 19(2), 235-242.
[33] Boucher, J.L., & Mutimer, B.T.P. (1994). The relative age phenomenon in sport - a replication and extension with ice-hockey players. Research Quarterly for Exercise and Sport, 65(4), 377-381.
[34] Sherar, L. B., Bruner, M. W., Munroe-Chandler, K. J., & Baxter-Jones, A. D. G. (2007). Relative age and fast tracking of elite major junior ice hockey players. Perceptual and Motor Skills, 104(3), 702-706.
[35] Till, K., Cobley, S., Wattie, N., O'Hara, J., Cooke, C., & Chapman, C. (2010). The prevalence, influential factors and mechanisms of relative age effects in UK Rugby League. Scandinavian Journal of Medicine & Science in Sports, 20(2), 320-329.
[36] Schorer, J., Cobley, S., Busch, D., Brautigam, H., & Baker, J. (2009). Influences of competition level, gender, player nationality, career stage and playing position on relative age effects. Scandinavian Journal of Medicine & Science in Sports, 19(5), 720-730.
[37] Fumarco, L., Gibbs, B.G., Jarvis, J.A. & Rossi, G. (2017). The relative age effect reversal among the National Hockey League elite. PLoS ONE, 12(8), Open Access.
[38] Ashworth, J. & Heyndels, B. (2007). Selection Bias and Peer Effects in Team Sports. The Effect of Age Grouping on Earnings of German Soccer Players. Journal of sports Economics, 8(4), 355-377.
[39] Vaeyens, R., Philippaerts, R. M., & Malina, R. M. (2005). The relative age effect in soccer: A match-related perspective. Journal of Sports Sciences, 23(7), 747-756.
[40] Wattie, N., Cobley, S., Macpherson, A., Howard, A., Montelpare, W. J., & Baker, J. (2007). Injuries in Canadian youth ice hockey: The influence of relative age. Pediatrics, 120(1), 142-148.