2024, Retos, 51, 955-961

The Relative Age Effect of Participants in the World Junior Tennis Finals in 2012–2016
El efecto de la edad relativa de los participantes en las finales mundiales de tenis júnior en 2012–2016

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Abstract. The main aim was to verify the Relative Age Effect (RAE) between female junior tennis players (U14, n=240), participants of the World Junior Tennis Finals in 2012–2016. The secondary aim was to verify the RAE on the order of nomination to each national team and then verify the RAE on the final ranking of the teams. The third aim was to compare the RAE between junior female tennis players and the world's best senior female players. *Chi*-square test and Effect Size (ES) index *w* were used for statistical data analysis. Statistically significant RAE was found in each of the years 2012–2016 for all subgroups, ES ranged between medium and large. Statistically significant RAE was found for all female players over the entire five-year period, ES was medium. Statistically significant RAE was found in all cases for nominations of players (the first, second and third tennis player of team), ES ranged between medium and large. In all four performance groups (1st-4th, 5th-8th, 9th-12th, 13th-16th), the RAE was statistically significant, ES was medium and large. Comparison of RAE between the groups of junior tennis players and the world's best players showed non-significant differences, the ES was small.
Keywords: Date of birth. Chronological age. Age distribution. Youth sports. Sports.

Resumen. Este estudio tuvo como objetivo principal investigar el impacto de la edad relativa (conocido como efecto de la edad relativa, EER; relative age effect, RAE) en jugadoras de tenis júnior (U14, n=240) que compitieron en las finales mundiales de tenis júnior entre 2012 y 2016. Un objetivo secundario consistió en analizar el EER en relación con la nominación de jugadores en los equipos nacionales, así como su influencia en las clasificaciones finales de dichos equipos. El tercer objetivo fue comparar el EER entre las tenistas júnior y las mejores tenistas sénior a nivel mundial. La metodología incluyó el análisis de datos mediante pruebas de *chi*-cuadrado y el cálculo del índice de tamaño del efecto (ES, por sus siglas en inglés) *w*. Los resultados indicaron que a lo largo de los años examinados (2012–2016), se observó un EER que, aunque no alcanzó significancia estadística en los subgrupos, mostró un rango variable de tamaño del efecto w, desde moderado hasta alto. Sin embargo, al considerar la totalidad del período de cinco años, se confirmó la existencia de un EER estadísticamente significativo, con un tamaño de efecto ES w de magnitud moderada.
Asimismo, se constató la presencia de un EER estadísticamente significativo en las nominaciones de jugadores para los equipos (primer, segundo y tercer tenista del equipo), con tamaños de efecto w que oscilaron entre niveles moderados y altos. Este patrón también se mantuvo en los cuatro grupos de rendimiento analizados (1º-4º, 5º-8º, 9º-12º, 13º-16º). Finalmente, al comparar el EER entre las tenistas júnior y las principales jugadoras sénior del mundo, se identificaron diferencias estadísticamente significativas, con un tamaño de efecto w de pequeña magnitud.
Palabras clave: Fecha de nacimiento. Edad cronológica. Distribución por edades. Deporte juvenil. Talento deportivo.

Fecha recepción: 30-04-23. Fecha de aceptación: 23-10-23
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Introduction

During the period of puberty, persons undergo major physiological, biochemical and psychological changes which take place during a relatively short period of time. These changes often cause significant differences between individuals, even though they are often born in the same year. This specific period is described as biological maturation in the professional literature (Cobley, Baker, Wattie, & McKenna, 2009; Malina et al., 2004; Matta et al., 2015).

Early researches in pedagogy (i.e., Green & Simmons, 1962) showed that older pupils from the same classes achieved better education results than their classmates born in the later months of the year. The first scientific studies in the field of sports devoted to the effect of date of birth appeared in early 1980s (for instance Deshaies, Pargman, & Thiffault, 1979). The term of Relative Age Effect (RAE), referring to the existence and subsequent advantage of being born earlier, was first used by Barnsley, Thompson and Barnsley (1985) in their ice hockey study. Many scientific researches focused on RAE over the years have shown that athletes born at the beginning of the year or near to the cutoff date, frequently achieve better sports performance due to the temporary biological advantage linked with a higher level of anthropometric and fitness characteristics and therefore better sports performance. Such individuals are often referred to as athletically talented, they are more often selected for elite teams, which allows them to gain experience, contacts, motivation and better training conditions which can lead to achieving a higher sports performance in the particular age category (Andronikos et al., 2016; Cobley et al., 2009; Deshaies, Pargman, & Thiffault, 1979; Fumarco, Gibbs, Jarvis, & Rossi, 2017; Grondin, Deshaies, & Nault in Cobley, Baker, Wattie, & McKenna, 2009).

Some sports pay the RAE issue a lot of attention; the most frequent are the studies aimed at football/soccer (Grossmann & Lames, 2013; Helsen et al., 2012; Saavedra-García et al., 2019), ice hockey (Barnsley et al., 1985; Hancock, 2017) and tennis (Gerdin et al., 2018; Moreira et al., 2017; O'Donoghue, 2014; Ulbricht et al., 2015). Other studies were devoted for instance to alpine skiing and snowboarding (Müller, Müller, Hildebrandt & Raschner, 2016; Romann & Fuchslocher, 2014), athletics (Brazo-Sayavera, Martinez-Valencia, Muller, Antronokos,

& Martindale, 2018; Kearney, Hayes & Nevill, 2018), basketball (Saavedra-García et al., 2014; Vegara-Ferri, García-Mayor, Pérez, Cabezos, 2019), handball (Camacho-Cardenosa et al., 2018; Saavedra, & Saavedra, 2020), swimming (Abbott, Moulds, Salter, Romann, Edwards, & Cobley, 2020; Costa et al., 2013), volleyball (Campos et al., 2016; Papadopoulou et al., 2019).

As already mentioned, a large number of studies is devoted to the effect of RAE on the performance of tennis players. Much attention is paid especially to the youth categories (U12–U18), where the differences between individuals in terms of ontogenetic development in the same age groups are most pronounced. Most authors agree that RAE influence on youth performance is greater in the U10–U14 than in the U15–U18 age categories (Filipcic, 2001; Giacomini, 1999; Pacharoni et al., 2014). The same authors came to the opinion that the RAE existence is less pronounced in girls than in boys and manifests itself at younger age (U12–14). The gender difference is usually explained by the earlier end of biological development in girls (Filipcic, 2001; Giacomini, 1999). In assessing RAE, various authors were dealing with both its occurrence in individual quarters (Q1–Q4) and in the first and second 6 months of the calendar year, sometimes referred to as semesters (Cobley, 2009; Edgar & O'Donoghue, 2005; Gerdin, 2018; O'Donoghue, 2009; 2014). In a number of studies focused on groups of older players including adults (U18 and above), it was stated that RAE is also reflected in adulthood; the share of players born in the first half of the year ranges from 58.5 to 63.2% in various statistical groups and rankings (Edgar & O'Donoghue, 2005; O'Donoghue, 2009). RAE has also been demonstrated in adult tennis players where the group born in the first half of the year scored more points in a single game than the group born in the second half (O'Donoghue, 2014).

With the transition of players from junior to senior category, RAE slightly increases in women (+5.4%) and decreases in men (-10%) (Edgar & O'Donoghue, 2005; O'Donoghue, 2009). Extensive research by Ulbricht et al. (2015) showed that RAE increased with growing level of athletic performance; however, no connection of RAE was proven with the process of biological development (maturity) and with the level of anthropometric and fitness characteristics. The largest representation of players (U12–U18) born in the first half of the year was among tennis players of national selections (n=57; 70.2%) and regional selections (n=381; 65.1%); the smallest representation among all the ranked players (n=7 165, 54.4%). Söğüt (2016) confirmed the impact of RAE in tennis on the level of movement competences in both boys and girls born in the first half of the year, who had significantly better results in the KTK test battery (Kiphard, & Schilling, 1974)) than the group born in the second half of the year.

An extensive research study of the group of the World Junior Tennis Finals participants (WJTF, U14) in the five-year period of 2007–2011 showed that significantly more players were born in the first half of the year (boys: n=239; 73.2%) (girls: n=240; 67.1%, Agricola et al., 2013; Agricola et al., 2017). Follow-up research on the same WJTF in 2012–2016 in the group of juniors (Bozděch et al., 2017) yielded – in addition to the confirmation of the same tendency in the percentage share of the participants born in the first half of the year in the monitored group (boys, n=240, 78.4%) – also additional findings: the above-mentioned trend was also found for all semi-finalists (n=60), for overall ranking of teams and for the ranking of nominated players.

This presented research deals with the issue of RAE existence in the U14 group of girls, who participated in the WJTF during the five-year period of 2012–2016 and follows the studies: Agricola et al. (2013), Agricola et al. (2017) and Bozděch et al. (2017). The aim of the research was to find out *(1)* how RAE manifests itself in the group of elite female junior tennis players in individual years and in the whole group in the period of 2012–2016; also *(2)* what is the difference in RAE impact between the groups of junior female players and elite senior female players in the WTA Rankings 2012–2016. We were also interested in *(3)* the impact of RAE on nominations of female players to national teams and on the final order of teams in the WJTF tournament.

Methods

Participants

The World Junior Tennis Finals (WJTF) is a tournament held by the International Tennis Federation (ITF) since 1991, in which three-member representation teams of male (16 teams, n=48) and female (16 teams, n=48) tennis players in the U14 age category participate every year. Therefore, in the monitored period of 2012–2016, a total of 240 female players participated in the WJTF tournaments (WJTF group). Female tennis players from individual countries are nominated for the WJTF tournament according to their current position in the national rankings. The participants of the tournaments are the winning national teams from the regional qualifications with added teams of the host country. For each team, 3 players are nominated for the position of the first, second and third tennis player, usually according to their performance. Each match between the national teams consists of two singles and one doubles. In order to compare their RAE with elite female senior players, an analysis was performed of the group of players who were ranked at the end of each calendar year (2012–2016) among the best 48 world female tennis players in the WTA Rankings (WTA group; n=240; number n=48 was selected because of comparability with the WJTF group). Although we are aware that some players may appear repeatedly in the summary results for the whole 2012–2016, the results reflect real situation in that period, which is also in line with the similar procedure of many other authors (for instance, da Costa, 2012; Edgar, & O'Donoghue, 2005; Gerdin, Hedberg, & Hageskog, 2018; Jackson, & Comber, 2020; O'Donoghue, 2009).

Procedures

Research data of the WJTF group of female players were obtained from the ITF official materials (date of birth, order of team nomination and final ranking of the team). Information about the dates of birth of the WTA group players and their positions in the WTA rankings were obtained from a publicly accessible Internet source (www.wtatennis.com). The athletes were categorized into four relative age quarters (Q) according to their birth month independently of birth year (i.e., Q1=January to March; Q2=April to June; Q3=July to September; and Q4=October to December) according to Delorme (2015).

Statistical analyses

The research data were statistically processed with the use of the methods of descriptive (relative and absolute frequency) and inferential statistics (*chi*-square tests, Effect Size (ES) index *w*) using the Microsoft Excel and STATISTICA 10 software. In order to assess the match of theoretical (expected) frequency distribution and empirical (observed) frequency distribution, we used the *chi*-square test (χ^2_G; df=3) in the Goodness of Fit variant because of the small size of data set. To evaluate the agreement of distribution between categorical variables, i.e., distribution between WJTF participants and Top 48 WTA tennis players, we used the *chi*-square test in its independence variant (χ^2_I; df=3) according to Pearson (1900). Due to the international participation in the WJTF tournament, the expected distribution of the date of birth was determined according to the number of days in individual quarters: Q1=24.7% (90.25/365.25); Q2=24.9% (91/365.25); Q3=25.2% (92/365.25); Q4=25.2% (92/365.25) according to Delorme (2015). To assess the degree of agreement, we used the ES index *w*, which can be interpreted, according to Cohen (1988), as small (*w*=0.10), medium (*w*=0.30) or large effect (*w*=0.50). In accordance with the opinion of a number of authors (Cohen, 1988; Hopkins, Marshall, Batterham, & Hanin, 2009; Sullivan & Feinn, 2012), when the conclusions of the assessments made with statistical significance (χ^2, *p*) and with material significance (*w*) are in conflict, we lean towards the conclusions resulting from the assessment of ES index *w*, due to the deliberate selection of the research groups.

Results

Comparison of the impact of RAE in the WJTF and WTA groups in the period of 2012–2016

Table 1 summarizes the results of the assessment of RAE existence in the WJTF and WTA groups both in individual years and in the whole monitored period of 2012–2016.

Table 1.
Comparison of the impact of RAE in WJTF and WTA groups in 2012–2016

	Q_1	Q_2	Q_3	Q_4	n	χ^2_G	p	χ^2_H	*p*	*w*
WJTF 2012	23/47.9 %	15/31.3 %	6/12.5 %	4/8.3 %	48	19.2	< .05	3.4	> .05	.19
WTA 2012	17/35.4 %	13/27.1 %	12/25.0 %	6/12.5 %	48	5.2	> .05			
WJTF 2013	17/35.4 %	14/29.2 %	10/20.8 %	7/14.6 %	48	4.8	> .05	1.2	> .05	.11
WTA 2013	21/43.8 %	11/22.9 %	11/22.9 %	5/10.4 %	48	11.0	< .05			
WJTF 2014	21/43.8 %	11/22.9 %	9/8.8 %	7/4.6 %	48	9.7	< .05	1.7	> .05	.13
WTA 2014	19/39.6 %	8/16.7 %	14/29.2 %	7/14.6 %	48	7.8	< .05			
WJTF 2015	20/41.7 %	14/29.2 %	9/18.8 %	5/10.4 %	48	10.5	< .05	1.8	> .05	.14
WTA 2015	16/33.3 %	12/25.0 %	14/29.2 %	6/12.5 %	48	4.7	> .05			
WJTF 2016	17/35.4 %	15/31.3 %	12/25.0 %	4/8.3 %	48	8.2	< .05	0.6	> .05	.08
WTA 2016	16/33.3 %	13/27.1 %	13/27.1 %	6/12.5 %	48	4.5	> .05			
WJTF 2012–16	98/40.8 %	69/28.8 %	46/19.2 %	27/11.3 %	240	46.8	< .05	4.9	> .05	.10
WTA 2012–16	89/37.1 %	57/23.8 %	64/26.7 %	30/12.5 %	240	30.7	< .05			

Table 1 clearly shows that concerning the values of ES index *w*, medium (*w*=0.31) to large (*w*=0.63) impact of RAE in individual years and medium impact of RAE (*w*=0.44) in the whole research period (2012–2016) were found. From the point of view of statistical significance, the hypothesis of a good agreement between the expected and observed distribution of the date of birth in all individual years and the whole period (except for 2013, $p>0.05$) is rejected; therefore, the existence of RAE cannot be rejected ($p<0.05$, resp. $p<0.01$). From the point of view of the preferred conclusions resulting from material significance (ES), the RAE impact can be considered to be medium in the years 2013, 2014, 2015, 2016 and in the whole period of 2012–2016, resp. large in 2012.

For a better visualization, Figure 1 shows the distribution of birth dates into individual quarters for the WJTF and WTA groups in 2012–2016. The figure indicates a decreasing trend in the relative number of WJTF female players in individual quarters (from Q1 to Q4), which is only partially reflected in WTA female tennis players.

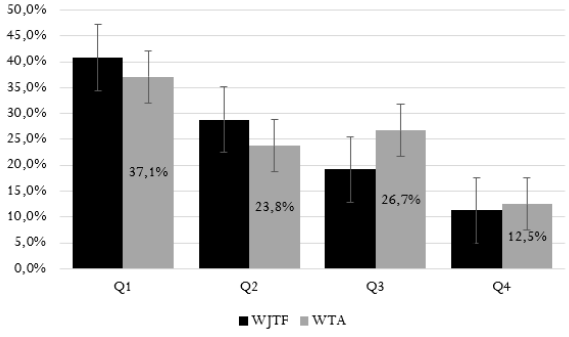

Figure 1. *Distribution of the dates of birth of the WJTF and WTA female players in the individual quarters of the year for the whole period of 2012-2016*

The following Table 2 presents the results of the statistical assessment of comparison of the impact of RAE in WJTF female players (girls; 13–14; n=240) and WTA female tennis players (women, n=240) who were ranked 1 to 48 in the WTA Rankings in the years of 2012–2016 (always as of 31st December).

Table 2.
Comparison of the impact of RAE in WJTF and WTA groups

	Q_1	Q_2	Q_3	Q_4	n	χ^2_G	*p*	*w*	χ^2_H	*p*	*w*
WJTF	98/40.8 %	69/28.8 %	46/19.2 %	27/11.3 %	240	46.8	< .05	.45	4.68	> .05	.10
WTA	89/37.1 %	57/23.7 %	64/26.7 %	30/12.5 %	240	30.9	< .05	.36			

Note: Q_i=quarter of the year, χ^2_G=*chi*-square test (Goodness of Fit), *p*=significance level, *w*=effect size (ES) index, χ^2_H=*chi*-square test (homogenity)

From the results given in Table 2, it is clear that a medium impact of RAE (WJTF: w=0.44, medium; WTA: w=0.34, medium) was – based on the calculation of ES index w – demonstrated for both groups. A statistically non-significant agreement of birth date distribution between the two groups and a small ES was found (p<0.05; w=0.10). From the point of view of statistical significance, the hypothesis of a good agreement (p<0.01) between expected and observed distribution of dates of birth in both groups (WJTF, WTA) is rejected, impact of RAE cannot be rejected. We reject the significance of the agreement of birth date distribution between the WJTF and WTA groups (p>0.05).

Relationship between RAE and female players' nomination for 2012-2016 WJTF

Table 3 shows both the absolute and relative values of frequency of the female players divided by date of birth into individual quarters (Q_i) and player nominations (rank 1–3). We tested the significance of RAE with the use of χ^2_G test and assessed it with ES index w and statistical significance.

Table 3.
RAE and female players' nomination for the WJTF - summary data of 2012–2016

Nominated	Frequencies	Q_1	Q_2	Q_3	Q_4	n	χ^2_G	*p*	*w*
1st rank	Abs/Rel	34/42.5 %	26/32.5 %	14/17.5 %	6/7.5 %	80/100 %	23.2	< .05	.54
2nd rank	Abs/Rel	31/38.8 %	23/28.8 %	14/17.5 %	12/15.0 %	80/100 %	11.5	< .05	.38
3rd rank	Abs/Rel	33/41.3 %	20/25.0 %	18/22.5 %	9/11.3 %	80/100 %	14.7	< .05	.43

Note: Q_i=quarter of the year, χ^2_G=*chi*-square test (goodness of fit), *p*=level of significance, *w*=effect size (ES) index

The distribution of dates of birth in all individual nomination positions in the team (rank 1–3) can be characterized in terms of both absolute and relative frequencies as $Q_1>Q_2>Q_3>Q_4$. From the results given in Table 3, it is clear that, based on the values of ES index w, a large RAE was demonstrated for the position of the 1st female player of the team (w=0.54) and a medium RAE influence for pro position of the 2nd female player (w=0.38), resp. 3rd female player (w=0.43). From the point of view of the assessment of statistical significance of χ^2_G test values, we reject the hypothesis of a good agreement between the expected and observed birth date distribution in all nomination positions in the team (p<0.01, resp. p<0.05); RAE cannot be rejected.

Relationship between RAE and team ranking in the2012-2016 WJTF tournament

Distribution (absolute and relative) of the date of birth (according to Q_i) and the results of the assessment of material (w) and statistical (χ^2_G) significance of the teams which finished as 1st-4th, 5th-8th, 9th-12th and 13th-16th at the WJTF tournament in the years of 2012–2016 are given in the Table 4.

Table 4.
Impact of RAE on final ranking of the teams at the 2012–2016 WJTF tournaments

Ranking	Frequencies	Q_1	Q_2	Q_3	Q_4	n	χ^2_G	*p*	*w*
1–4	Abs/Rel	21/35.0 %	22/36.7 %	12/20.0 %	5/8.3 %	60/100 %	12.9	< .05	.46
5–8	Abs/Rel	26/43.3 %	16/26.7 %	10/16.7 %	8/13.3 %	60/100 %	13.1	< .05	.47
9–12	Abs/Rel	26/43.6 %	18/30.0 %	11/18.3 %	5/8.3 %	60/100 %	16.4	< .05	.52
13–16	Abs/Rel	26/43.6 %	12/20.0 %	13/21.7 %	9/15.0 %	60/100 %	11.3	< .05	.43

Note: Q_i=quarter of the year, χ^2_G=*chi*-square test (goodness of fit), *p*=level of significance, *w*=effect size (ES) index

Table 4 shows that, based on the values of ES index w, a large impact of RAE was demonstrated for the teams ranking 9–12 (w=0.52), a medium impact of RAE for the teams ranking 5–8 (w=0.47), 1–4 (w=0.46) and 13–16 (w=0.43). From the point of view of assessing the statistical significance of the values of χ^2_G test, we reject the hypothesis of a good agreement between the expected and observed distribution of the date of birth in all the rankings of the teams (p<0.01, resp. p<0.05); again, the impact of RAE cannot be rejected.

Discussion

The presented study was dealing with the existence of

RAE in junior female players (U14) who participated in the WJTF tournaments in the years of 2012–2016 (n=240). Assessment of the distribution of birth dates of female players both in the whole observed period (Q_1=98/40.8%; Q_2=69/28.8%; Q_3=46/19.2%; Q_4=27/11.3%; χ^2_G=46.8; w=0.44; ES=medium; p<0.01) and in individual years (w=0,32–0.47; ES=medium) demonstrated a medium impact of RAE (with the exception of 2012, w=0.63, ES=large). This finding is different from the results of Edgar and O'Donoghue (2005), resp. O'Donoghue (2009), who demonstrated only a small impact of RAE in the group of ITF junior league female players both in the years of 2002–2003 (n=239, χ^2_G=11.1; w=0.22; ES=small; p<0.05) and in the years of 2008–2009 (n=322; χ^2_G=3.6; w=0.11; ES=small; p=0.31). Both mentioned studies (Edgar & O'Donoghue, 2005; O'Donoghue, 2009) also investigated the effect of RAE in senior female participants in the Grand Slam tournaments in 2002–2003 and 2008–2009. For both groups of female players participating in the Grand Slam tournaments in 2002–2003 (n=211; χ^2_G=12.9; w=0.25; ES=small; p<0.05), resp. in 2008–2009 (n=183; χ^2_G=9.2; w=0.22; ES=small; p<0.05), only a small impact of RAE was detected.

When comparing the results of the presented study with the conclusions found, resp. calculated from the results of Bozděch et al. (2017) for the group of male players in the 2012–2016 WJTF tournaments, a large impact of RAE was found both in the whole observed period (n=240; χ^2=109.96; w=0.68; p<0.01) and in individual years (w=0.59–0.83; ES=large). The existence of RAE is therefore significantly stronger in male players than in female players.

The above-mentioned results of the WJTF female players in the years of 2012–2016 (n=240) can also be compared with the results of a similar study by Agricola et al. (2013, 2017), who investigated the impact of RAE in WJTF participants (n=240) in 2007–2011 and found a similar distribution of the date of birth in female players, i.e., Q_1=40.8% (diff=0.0%), Q_2=26.3% (diff=2.5%), Q_3=22.1% (diff =-2.9%), Q_4=10.8% (diff =0.5%). Furthermore, they demonstrated a statistically significant difference in the number of female players born in the first and second semester (t=7.5, $tTab_{0.05}$=1.96) and in the first and second quarter of the year (t=2.6, $tTab_{0.05}$=1.96); a statistically significant difference, however, was not demonstrated among female tennis players born in Q_3 and Q_4 (t=1.4, $tTab_{0.05}$=1.96).

Ulbricht et al. (2015) report that the influence of date of birth increases in the German tennis league with increasing age and performance category (U12–U18; male; n=120 851). Similar conclusions were reached by Gerdin, Hedberg, and Hageskog (2018) for Swedish female tennis players (n=934; 14–18); however, according to Filipčič (2001), the influence of the date of birth is significant for Slovenian female tennis players at the national representation level in the U12 (n=60) and U14 (n=60) categories, but not in the U16 (n=60) and U18 (n=60) categories. Which are contradictory conclusions than in the previous studies. The reason for these different conclusions can be both the size of the examined group and the currentness of the research data.

At the national level, the authors Koloničný, Bozděch and Zhánĕl (2018) found a statistically significant impact of the RAE (p<0.05) in 13 from 15 monitored tennis seasons (n=1500). After calculating the ES index w for the results of these authors, it was proven that a medium (w=0.20) to large impact of RAE (w=0.56) was found in individual seasons, which are lower values than in our research group.

The suitability of not only presenting, but also comparing the results not with the use of statistical significance (χ^2_G), but ES index w can be shown on the example of our results from the whole research group (χ^2_G=46.8; p<0.01; w=0.44; ES=medium) as well as the work of Moreira, Lopes, Faria, and Albuquerque (2017), who investigated the impact of RAE in junior male tennis players (participants of ITF tournaments) in 2013 (n=2441) and found a statistically significant existence of RAE in the whole research group (χ^2_G=102.33; p< 0.001; w=0.20; ES=small); however, their research was affected by the size of the research group. This problem is eliminated by the use of ES, thanks to which it can be seen that the work of Moreira et al. (2017) achieved a small effect (w=0.20), which is, on the contrary, a smaller impact of date of birth than was found in this study (w=0.44).

As already mentioned, one of the main reasons for a smaller impact of RAE in girls as in boys is most probably also the earlier end of puberty (adolescence) in girls. In the period of puberty, when the differences are most pronounced for boys, this period is usually almost over for girls and individual differences are not so significant. Another important reason is that girls' variants of sports are often not so physically demanding; therefore, the advantage for instance in the field of fitness abilities is not so distinct or decisive. The last argument is that pubertal changes in girls do not necessarily involve a significant performance increase, as they do in boys (Baker et al., 2009; Cobley et al., 2009).

Due to the purposeful research group, when the conclusions between statistical (χ^2_G) and material significance (w) are in conflict, we lean towards the conclusions of material significance (Ellis, 2010). For these reasons, the "Abstract" and "Conclusion" chapters present only the results of material significance (w). We chose this approach to avoid a Type I Error (reject a true null hypothesis), which could be committed due to the larger size of the research group (Cohen, 1988; Hopkins, Marshall, Batterham, & Hanin, 2009).

Conclusion

The results demonstrated a significant existence of RAE in the group of the best U14 female tennis players participating in the 2011–2016 WJTF tournaments both in individual years and in the group of all the female tennis players in the given five-year period. The highest number of players

by their date of birth was found in the first quarter of the year and was significantly decreasing during the following quarters.

A similar conclusion on RAE can also be made in the case of the nomination of female players to all three positions in the competition team: a large impact of RAE was demonstrated for the position of 1st female player of the team; a medium one for the position of 2nd, resp. 3rd female player.

During the assessment of the impact of RAE on the final ranking of the teams, a significant RAE was demonstrated in all four performance groups of the teams. A large RAE was found in the 9– 12 group and a medium RAE in all other three groups ranking 1–4, 5–8 and 13–16.

The comparison of RAE between the junior group and the TOP 48 WTA senior tennis players did not bring any significant difference in the distribution of dates of birth in the four quarters of the year and the differences between quarters were significant in both the groups. Junior female players differed from senior tennis players in numbers in individual quarters. There were fewer senior tennis players in Q_1 a Q_2 than junior tennis players; however, it was the opposite in Q_3 and Q_4.

As a conclusion, it can be stated that RAE plays a significant role in junior elite female tennis players in all the observed criteria. It is therefore desirable for tennis coaches, officials and everyone else involved in the training process to be familiar with this issue and its possible consequences for further spots career.

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