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Research article

RELATIVE AGE EFFECT CREATES A DISCRIMINATION AND DROPOUT PANDEMIC IN YOUTH FOOTBALL: SHOULD EVERYONE GET THE SAME CHANCE?

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Abstract. *The goal of this study was to determine the dropout rate and the difference between football players born in different halves of the year. This study involved 101 sub-elite football players (14.4±2.9 yr, 168.2±9.4 cm, 60.1±5.3 kg, 21.7±2.2 BMI) divided into three age categories and two sub-groups for each of them (U-11a/b, U-14a/b and U-19a/b). The difference between the sub-groups was assessed using the T-test for independent groups and the Mann-Whitney U test with statistical significance set at the p < .05 level. The 10, 20 and 30 m running tests, SJ, CMJ, CMJmax, T-test, 9-3-6-3-9, and Slalom agility tests were used. Statistical difference for U-11 group was obtained for the SJ (p = .002), T-test (p = .012) and 9-3-6-3-9 test (p = .002). In U-14 group the statistical difference is shown in all speed and explosive strength tests (p < .05). Body fat did not show a statistically significant difference between groups while body height, body mass and muscle mass differ at a statistically significant level (p = .017, .041, .0.46, respectively). Compared to younger groups, U-19 group showed a significant difference on T-test and 10 m running (p = .017, .037, respectively). The main limitation is that this is not a longitudinal study with a single group followed throughout the process. In conclusion, it would be desirable for everyone to get an equal chance due to the different speed of development in order to be competent. Further recommendations are to divide youth categories into two separate leagues so that everyone gets the same playing time.*

Key words: *peak height velocity, adolescents, soccer, power performance*

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1. INTRODUCTION

In almost all sports, including football, when it comes to youth categories, the calendar year is taken as a range for making team selections, with the intention of giving everyone an equal chance (Musch & Grondin, 2001). This way of dividing the players is ignoring the potential differences that may occur between young athletes born in the same year such as power performance or morphological characteristics, thus discriminating against those born later in the year (Fragoso, Massuca, & Ferreira, 2015). It is also the case that in some competitions, athletes are classified into two age groups, which brings the difference between the youngest and the oldest to almost two years. It is, therefore, often seen that the imbalance in the number of players is in favour of those born earlier but the results do not necessarily show that they perform better on the tests (Peña-González et al., 2018). This type of discrimination is common due to the subjective assessment of coaches who tend to give more chances for success to the accelerants, those who entered puberty earlier, or who can currently provide better results regardless of the real potential that players have for the future (Figueiredo et al., 2019).

A problem with RAE is not a new phenomenon. Barnsley, Thompson, & Barnsley (1985) described it first and over the years it has been confirmed in many countries (Bezuglov et al., 2019; Rubajczyk & Rokita, 2018), and in many competitions (Brustio et al., 2018; González-Víllora, Pastor-Vicedo, & Cordente, 2015). In accordance with this is also one Brazilian study that examined data from 202.951 football players that played between 1921 and 1996 and concluded that with every decade RAE showed progressive growth (Costa, Albuquerque, & Garganta, 2012).

As many differences have been noted due to RAE, football players born earlier in the year are more likely to make a better impression on coaches and other sports experts and thus be considered as more talented. Portrayed as better, they can be given more opportunities to succeed by including them earlier in training centers and national teams, which allows them faster development, working with high-level coaches, training with better peers and playing against tougher opponents while using better facilities. During adolescence, younger players may feel inferior because of the lower functional capacities and can be portrayed as weaker and slower (Delorme, Boiché, & Raspaud, 2010b). Because of this, players born closer to a start of the year tend to have more playing time and, consequently, can improve their motivation, competitive skills, emotional stability and teamwork which can help them enhance their development (Baker & Logan, 2007). The consequences of the large number of dropouts in youth football are even visible at the top senior level where we also see an uneven distribution of players born at the beginning and at the end of the year, which can lead to unformed football players being rejected as untalented or not good enough, later resulting in not fulfilling their full potential and reducing the quality of clubs and national teams (Jiménez & Pain, 2008).

Previous research stated that there is a prevalence of football players born in the first quartile of the year in contrast to those born later (Skorski et al., 2016) and that older players often tend to be taller and heavier than their younger peers ($p < .05$) (Carling et al., 2009) and therefore achieve better test scores (Lovell et al., 2015). Much more research states that football players born early have a physical advantage over their peers but the results are not unified since they mostly depend of the participants' age. Peña-González et al. (2018) found moderate effect size body height, In contrast to this, Figueiredo et al. (2019) found almost no significant effect size between players born in different quartiles in 13-year-old male football players in body height and weight (η2 = .08, .05 respectively) and in the counter movement jump, running speed, and endurance (η2 = .01). Lovell et al. (2015) found a prevalence of players born in the first half of the year with most of them born in the first quartile in all the studied categories (U10, U12, U14, U16 & U18). The authors noted moderate effect size for body mass only in the U14 group (η2 = .62; p = .00), while for the rest of the groups the results were trivial or small for this variable. Motor skill tests showed a statistically significant difference in the U14 groups for the 10 m sprint, 20 m sprint, and agility (p – .000, .000, .021, respectively) while there was no difference in other groups between younger and older players.

Although RAE is widely examined, previous research mainly focused on birth quartiles and only one paper examined player differences by dividing them into those born in the first and second part of the year (Peña-González et al., 2021). This paper had 3 age categories but those categories followed one another without taking into account the potential differences of this phenomenon that may appear in ages that are not so close. Based on all of this, the main goal of this study was to determine the dropout rate in the top national youth club and to establish the difference between football players born in different halves of the year in three different age categories.

2. The Method

2.1. Participants

This study involved 101 sub-elite football players members of the same team playing in the top youth league (14.4±2.9yr, 168.2±9.4cm, 60.1±5.3kg, 21.7±2.2 BMI) divided into three age categories: group 1 (U-11) (n = 33, 11.5±0.2 yr, 145.2±3.1 cm, 41±2.9 kg, 23.3±1.4 BMI), group 2 (U-14) (n = 36, 14±0.4 yr, 168.8±4.2 cm, 59±3.6 kg, 21.4±2.6 BMI), and group 3 (U-19) (n = 32, 18.3±0.2 yr, 180.4±3.7 cm, 72±2.3 kg, 20.5±1.9 BMI) who, at the time of testing, had a training experience of 7.5±4.1 years. All groups were later divided into two sub-groups. The first sub-group included players born in the first half of the year (January 1 – June 30) and the second sub-group included players born in the second part of the year (July 1 – December 31). The youngest group (U-11) for this study was selected because of the fact that it is the first age group that plays 11v11 football on a full-size pitch. The second group (U-14) was selected based on the fact that this is the time period when the players reached adolescence and can show the biggest difference in RAE between accelerants and late bloomers (Vänttinen et al., 2011) because that is a period where peek height velocity (PHV) is near the end for players who started their PHV period earlier (Derman, 2013), and the third group (U-19) was selected because it is the last age category that plays youth football before the first team selection and all of them should exceed their PHV so the RAE should not be as noticeable in this group (Cobley et al., 2009). The consent of all participants (or their parents/guardians if they are underaged) regarding their voluntary participation in this research was obtained. The testing was carried out at the end of the competitive season in accordance with the Declaration of Helsinki and was approved by the Institutional Ethics Committee of the Faculty of Sport and Physical Education, University of Nis, Serbia (protocol code 04-831/1 and date of approval July 4, 2023). The participants were required to restrain from strenuous physical activity for 48h prior to testing.

2.2. Procedures

Testing of all groups of participants was done in one day. In the morning (08:00-11:00) body composition and anthropometric characteristics were measured, while in the afternoon (14:00-17:00) motor skills were measured. The participants were asked not to consume food and water for at least 12 hours before the beginning of the body composition measurement. During the first part of measurement, they were minimally clothed and barefoot. The motor skills tests were conducted on a football field with artificial grass, and the participants wore shorts, a t-shirt and football shoes. Before the beginning of the test, all of the participants performed a standard football warm-up lasting for 25 minutes, which consisted of: 10 minutes of aerobic running with dynamic stretching exercises, 5 minutes of warming up passing a ball , then 2x3 minutes of technical-tactical play on a reduced space and finally 1-2 minutes of potentiation exercises (jumps, maximum short sprints).

2.3. Anthropometry measurements

The first part of testing involved assessment of body composition using an OMRON® body composition monitor (BF-508). The participants were asked to step barefoot onto the measurement platform and to place feet on the foot electrodes. The participants held the grip electrodes firmly with hand and arms extended straight to their body. As the measurement completed, Body mass (BM), Muscle mass, BMI, body fat (BF) and visceral fat (VF) were subsequently recorded. For body height, the participants stood upright on a flat, firm surface without shoes and with their head in an upright position using a Martin anthropometer, GPM 101 (GPM GmbH Switzerland), accurate to 0.1 cm.

2.4. Running speed

Running speed performance was assessed by a linear 30-m sprint test with split times at 10 and 20 m. The participant is in a high start position with one foot just behind the starting line. At the meter's signal, the participant starts and runs the marked distance at maximum speed on a artificial grass surface. It is very important that the participant does not slow down before passing the last gate. Each participant had one attempt and in case of a bad start or interference during the run, a new attempt is allowed after a 2-minute break. The results are automatically stored on the computer. Sprint and split times were measured with four Witty photocell gates (Microgate, Italy), positioned at the starting line, 10 m, 20 m, and finish line (30 m), and all the results were recorded with an accuracy of 0.01 s.

2.5. Explosive strength

Explosive strength was assessed based on the squat jump (SJ), counter movement jump (CMJ) and counter movement jump with free arms (CMJmax) using the Optojump (Microgate, Italy) with an accuracy of 0.001 s. The participants performed a standardized warm-up before testing procedure. Jump height was recorded to the nearest 0.1 cm. Each participant had 3 attempts on each test. The pause between each attempt was 2 min.

2.6. Agility

Agility was assessed through the T-test, 9-3-6-3-9 and Slalom test. For the agility T-test, the participants began with both feet behind starting point A. At their own discretion, each participant sprinted forward 9.14 m (10 yd) to point B and touched a cone with their right hand. They then shuffled to the left 4.57 m (5 yd) and touched a cone (C) with their left hand. Participants then shuffled to the right 9.14 m and touched a cone (D) with their right hand. They then shuffled to the left 4.57 m back to point B and touched a cone once again, ran backward, passing the finish line at point A. Three test trials were performed, and times were recorded using Witty photocell gates (Microgate, Italy) mounted on a tripod with a height of 0.75 m at the starting line, with an accuracy of 0.01 sec. The second agility test used in this study is the 9-3-6-3-9 test where players run straight the whole time, run 9 m, touch the first cone (A) with one hand, make a 180° left or right turn, run 3 m to the second cone (B), again make a 180° turn, run 6 m (C), then they make another 180° turn, run another 3 m (A) before finally turn the last time and run 9 m to the finish line. The Slalom test is another commonly used agility test because of its simplicity. The task is to run around 6 cones, each one 2 m apart from the previous with the first cone 1 m away from the starting line. The goal is to run between cones, changing direction from right to left until each participant passes the last cone. Then he makes a 180° turn and runs to the starting line in the same pattern between the cones (Sporis et al., 2010).

2.7. Statistical analysis

Data analysis was performed with Statistical Package for Social Sciences (SPSS for Windows®, version 26.0.). Descriptive statistics were applied to evaluate the participants' basic characteristics and the Kolmogorov-Smirnov test was applied to confirm normality. The difference between the two sub-groups for every age group was assessed with the T-test for independent samples and when normality of distribution was violated, the Mann-Whitney U test was used. Effects Size (Cohens' *d*) will be determined based on the following <0.2 very small, 0.2-0.5 small, 0.5-0.8 medium and >0.8 large effect size (Cohen, 2013). Statistical significance was set at the $p < .05$ level.

3. Results

The difference is noticeable between groups with a progressive increase in the results towards the older categories. The results of field tests clearly show that players in the older categories are better in all parameters than the players from younger categories. The biggest difference is seen on the explosive strength tests where technique and experience on how to produce maximal power is needed with movements not so common in football practice.

In all categories there are more players born in the first half of the year and that percentage is increasing with each category. In the U-11 groups, 54.5% of players are born in the first half while in the oldest category as much as 71.9%. The results given in this table represent the number of male children born in country in the same years as the participants in this study. In contrast to the results in this study, each year there is a prevalence of children born in the second half of the year which is the second sign that football players born in the first half of the year get more chances than their peers.

Table 1 Anthropological characteristics for the three age groups

	U-11 (n – 33)	U-14 (n – 36)	U-19 (n – 32)	Mean ± SD
BH (cm)	145.24 ± 3.1	168.86 ± 4.2	180.42 ± 3.7	163.86 ±10,24
BM (kg)	39.1 ± 2.9	53.9 ± 3.6	72.3 ± 2.3	55.12 ±11.35
BMI	23.3 ± 1.4	21.4 ± 1.6	20.9 ± 1.1	21.8 ± 1.8
BF (%)	15.5 ± 3.9	12.8 ± 4.3	12.9 ± 4.2	14.05 ± 4.54
MM (%)	39.7 ± 1.9	40.3 ± 2.1	42.5 ± 2.9	41.09 ± 2.65
10 m (s)	2.03 ± .06	1.93 ± .06	1.84 ± .04	1.91 ± .08
20 m (s)	3.67 ± .18	3.31 ± .16	3.11 ± .08	3.32 ± .24
30 m (s)	4.99 ± .32	4.49 ± .29	4.16 ± .78	4.51 ± .67
CMJ	20.42 ± 1.71	26.57 ± 4.58	33.41 ± 2.71	27.74 ± 4.25
CMJmax	24.98 ± 3.12	31.42 ± 4.79	40.82 ± 6.62	33.64 ± 7.39
SJ	17.71 ± 2.26	24.12 ± 4.25	31.53 ± 3.01	25.50 ± 5.62
T-test (s)	12.35 ± .21	11.09 ± .58	9.41 ± .26	10.72 ± .87
9-3-6-3-9 (s)	9.79 ± .35	8.25 ± .27	7.71 ± .34	8.84 ± .79
Slalom (s)	7.90 ± .39	7.11 ± .38	5.99 ± .31	6.85 ± .66

Note: BH (cm) = body height; BM (kg) – body mass; BMI = body mass index; BF (%) = body fat percentage; MM (%) = muscle mass percentage; 10 m, 20 m, 30 m = split times for running speed; CMJ = countermovement jump; CMJmax = countermovement jump with arm swing; SJ = squat jump; T-test, 9-3-6-3-9, Slalom = agility tests

Table 2 The number of players and number of male children born in each half of the year

	U-11		U-14		U-19	
	U-11a	U-11b	U-14a	U-14b	U-19a	U-19b
n	18	15	21	15	23	9
pp%	54,5	45,5	58,3	41,7	71,9	28,1
nbc	16993	18815	16894	18329	19243	21101
bc%	47,5	52,5	48	52	47,7	52,3

(*Source*: https://www.stat.gov.rs/)

Note: n = number of players born in each half of the year; p% = percentage of players born in each half; nbc = number of male children born in country in each half of the year for the given groups; c% = percentage of male children born in each half of the year in the country; a = players born in first half of the year; b = players born in second part of the year

In Table 3, the results for two U-11 groups are presented. The only statistical difference is shown in the 9-3-6-3-9 agility test (p = .002) and SJ test (p = .002). The other tests did show discrimination between the sub-groups but without statistical significance. The ES showed a small effect in 20 m, 30 m, Slalom test, CMJmax, SJ, BH and BF (*d* - .09, .06, .09, .02, .01, .03, respectively) and a moderate effect in 10 m, T-test, 9-3-6-3-9, SJ, BM and MM (*d* - .53, .53, .38, .21, .29, .21, .72, respectively) with no large effect size in any test.

Table 3 Differences in the U-11 groups between players born in different halves of the year

	U-11a	U-11b	p	ES
BH (cm)	145.18 ± 4.47	145.23 ± 5.19	.862	.01
BM (kg)	40.22 ± 4.73	39.15 ± 5.05	.131	.21
BF (%)	15.58 ± 4.31	15.41 ± 4.85	.335	.03
MM (%)	40.31 ± 1.27	39.22 ± 1.72	.129	.72
10 m (s)	2.02 ± .08	2.04 ± .10	.529	.53
20 m (s)	3.68 ± .11	3.67 ± .11	.615	.09
30 m (s)	4.99 ± .12	4.98 ± .18	.862	.06
CMJ (cm)	20.31 ± 2.45	20.55 ± 1.59	.088	.21
CMJmax (cm)	24.94 ± 3.38	25.02 ± 3.12	.102	.02
SJ (cm)	17.42 ± 2.18	18.01 ± 1.91	.002	.29
T-test (s)	12.26 ± .33	12.45 ± .39	.002	.53
9-3-6-3-9 (s)	9.72 ± .39	9.85 ± .28	.012	.38
Slalom (s)	7.89 ± .31	7.92 ± .29	.148	.09

Note: BH (cm) = body height; BM (kg) = body mass; BMI = body mass index; BF (%) = body fat percentage; MM (%) = muscle mass percentage; 10 m, 20 m, 30 m = split times for running speed; CMJ – countermovement jump; CMJmax = countermovement jump with arm swing; SJ = squat jump; T-test, 9-3-6-3-9, Slalom = agility tests

In Table 4, the results for the two U-14 groups are presented. Statistical difference is shown in all speed and vertical jump tests ($p<.05$). Agility tests did not show a statistical significant difference between football players born in the first and those born in the second part of the year for the U-14 groups. When anthropometric characteristics are taken into consideration, only BF does not show a statistically significant difference between groups while BH, BM and MM differ on a statistically significant level (p = .017, .041, .0.46, respectively). Small effect size was recorded on the T-test, 9-3-6-3-9 and Slalom tests (*d* - .18, .18 and .05, respectively), moderate effect size was recorded on 10 m, 20 m, 30 m, CMJ, CMJmax, SJ, BM, BF and MM (*d* - .53, .62, .26, .39, .48, .37, .74, .33 and .43, respectively) with a large effect size only for BH (*d* - 83).

Table 4 Differences in the U-14 groups between players born in different halves of the year

	U-14a	U-14b	p	ES
BH (cm)	169.95 ± 6.32	163.21 ± 9.53	.017	.83
BM (kg)	56.71 ± 9.04	49.53 ±10.26	.041	.74
BF (%)	12.21 ± 3.26	13.74 ± 5.64	.326	.33
MM (%)	40.31 ± 1.27	39.22 ± 1.72	.129	.43
10 m (s)	1.91 ± .08	1.95 ± .07	.033	.53
20 m (s)	3.27 ± .16	3.35 ± .14	.006	.62
30 m (s)	4.45 ± .33	4.54 ± .37	.003	.26
CMJ (cm)	28.23 ± 3.94	26.57 ± 4.58	.007	.39
CMJmax (cm)	33.92 ± 3.91	31.85 ± 4.64	.001	.48
SJ (cm)	25.65 ± 3.88	24.12 ± 4.25	.007	.37
T-test (s)	10.99 ± .55	11.09 ± .58	.173	.18
9-3-6-3-9 (s)	8.22 ± .27	8.27 ± .27	.117	.18
Slalom (s)	7.10 ± .35	7.12 ± .38	.633	.05

Note: BH (cm) = body height; BM (kg) = body mass; BMI = body mass index; BF (%) = body fat percentage; MM (%) = muscle mass percentage; 10 m, 20 m, 30 m = split times for running speed; CMJ = countermovement jump; CMJmax = countermovement jump with arm swing; SJ = squat jump; T-test, 9-3-6-3-9, Slalom = agility tests

In Table 5, the results for the two U-19 groups are presented. In contrast to the previous group this group got statistical significance on just two tests. The only statistical difference was shown in the T-test agility test (p = .017) and the 10 m running test (p = .037). The other tests did show the discrimination between sub-groups but without statistical significance. In the U-19 groups, BH and BM shows a statistically significant difference (p = .002 and .008, respectively), while BH (p = .759) and BM (p = .309) and does show difference but not on a statistically significant level.

Table 5 Differences in the U-19 groups between those born in different halves of the year

	U-19a	U-19b	p	ES
BH (cm)	179.14 ± 5.24	179.67 ± 6.32	.759	.09
BM (kg)	71.61 ± 6.34	73.73 ± 7.57	.309	.31
BF (%)	12.96 ± 3.44	16.31 ± 3.02	.002	1.03
MM (%)	43.70 ± 2.19	41.87 ± 2.12	.008	.85
10 m (s)	1.83 ± .06	1.87 ± .05	.037	.36
20 m (s)	3.11 ± .08	3.13 ± .08	.329	.08
30 m (s)	4.16 ± .32	4.17 ± .78	.210	.01
CMJ (cm)	33.57 ± 2.74	33.05 ± 2.67	.538	.19
CMJmax (cm)	40.42 ± 7.21	41.80 ± 5.06	.502	.22
SJ (cm)	31.61 ± 3.06	31.36 ± 2.96	.801	.08
T-test (s)	9.35 ± .21	9.54 ± .31	.017	.71
9-3-6-3-9 (s)	7.65 ± .35	7.85 ± .29	.026	.62
Slalom (s)	5.95 ± .29	6.08 ± .32	.148	.43

Legend: BH (cm) – body height; BM (kg) – body mass; BMI – body mass index; BF (%) – body fat percentage; MM (%) – muscle mass percentage; 10 m, 20 m, 30 m – split times for running speed; CMJ – countermovement jump; CMJmax – countermovement jump with arm swing; SJ – squat jump; T-test, 9-3-6-3-9, Slalom – agility tests

4. Discussion

The main goal of this study was to assess the difference between football players born in the first half of the year and their peers born in the second half of the year in anthropometric measurements and power performance. The second goal was to determine the dropout rate in male youth football and number of players that are playing in the starting eleven for each tested category. The results show a big difference in the U-14 groups and a little to no difference in the U-11 and U-19 groups and biased distribution in favour of players born in the first half of the year (approximately 63%) which is in accordance with previous research where distribution of the players born in the first half of the year goes up to almost 80% in some categories (Hirose, 2009).

Football is becoming an increasingly physically demanding sport and because of that coaches often force players to go beyond their limits. The problem is that more and more coaches have the same demands for younger football players and if they cannot fulfill the expectations right away they often tend to be discriminated against and removed from their teams. Because of that, players who mature faster and get physically bigger, get more playing chances and thus become more experienced. Anthropological characteristics and body composition parameters between the U-11 sub-groups are not statistically significant because they still did not reach adolescence so they do not differ much from each other (Vänttinen et al., 2011). Although some differences are noticed, and they are in favour of the group of players born in first half, there is no statistical difference. Most studies that had a U-11 group showed similar findings, where they found a prevalence in the number of players born toward the start of the year but due to a lack of physical characteristics and bigger hormonal activations they are still on the same level of performance (Towlson et al., 2021). In the U-14 group a statistically significant difference is recorded in all parameters except BF. That can easily be explained by the same training volume which players have during the week and thus not allowing body fat to accumulate. Other parameters are in favour of players born in the first half of the year because most of them are near the end of PHV and have an advantage in contrast to their peers that will, on average, reach that period a few months later (Del Campo et al., 2010). Altimari et al. (2021) also proved the difference between relatively older players and those born later during the year but Massa et al. (2014) showed a decreased RAE in the U-14 group in comparison to other age categories due to a different competition level and the club's ability to select players. Delorme, Boiché, & Raspaud (2010a) examined RAE in all French youth leagues and found that the greatest dropout of players occurs around the age of fourteen and the possible reason can be justified by the finding of Hirose (2009) who observed that anthropometrical variables were similar among U-10 football players, but in the U-14 group older players were statistically taller and heavier. In contrast to this, Malina et al. (2007) found no difference in BH, BM and the performance between players born later and earlier in the year. This difference might occur due to the level of competition. The youth club/academy might have that advantage to make a selection earlier and only keep players born later during the year that can fulfill every task at a same level as their older peers (Hirose, 2009). In the oldest group, the results are in favour of the relatively younger group, when we examine BH and BM, but with no statistical difference. Relatively older players have a statistically significant better BF and MM percentage which might be due to additional strength training some of them have that was not taken as a variable in this study.

Development of running speed is one of the most difficult tasks in football and coaches and sport scientists are always looking for better solutions. Since running speed consists of stride length and velocity, enhancing one of those two parameters directly influence running speed so it has been shown that an increase in running speed is associated with body height in youth football players mostly due to a bigger stride length (Wong et al., 2009). The results of this study show that when a group of football players (U-14) is statistically significantly taller than their peers they also get significantly better running speed results. On the other hand, no statistically significant difference was found between the U-11 and U-19 sub-groups, both in BH and speed performance. These results were confirmed by other studies where BH is found to be directly correlated with running speed in male youth football players (Mathisen & Pettersen, 2015).

Explosive strength, in the form of the achieved vertical jump height, is considered a good indicator of success in football, so functional testing of football players in which the vertical jump is not assessed is almost unthinkable (Stølen et al., 2005). The height of the jump on the tests showed a connection with success in youth categories (Mujika et al., 2009). Jump height is the most appropriate indicator due to its reliability, simplicity and the ability to track progress (Stølen et al., 2005). This study, in the U-11 group, showed a statistically significant difference only in the SJ test and not the CMJ and CMJmax tests, all three in favour of players born in second part of the year. This can be due to a better understanding of some players on how to prepare and use the body swing properly to gain maximal force. In accordance with these results are findings of a study which stated that there is no difference in the vertical jump performance between the U-10 and U-12 groups of players divided by quartiles (Lovell et al., 2015). In the U-14 group that difference is statistically significant in all three vertical jump tests ($p < .05$) and it can, as running speed, be explained by longer limbs and the overall physical dominance of players who entered their PHV first and gain more muscle mass which is important for the development of explosive strength (Perroni et al., 2014). These results are confirmed by almost all previous research that included this age group of football players (Currie, 2018). Lastly, the U-19 group showed no difference between players born in the first and those born in the second half of the year because, as explained earlier, by the time they are 19 they have to be ready for first team football and players born in the second part of the year do not show any maturational difference in relation to their peers. Previous research that examined U-19 and older players also concluded that there was no difference between birth quartiles, but all of them confirmed a larger number of players born in the first half of the year (Brustio et al., 2018).

Agility tests, in contrast to the above-mentioned tests, showed differences between the U-11 and U-19 groups and not in the U-14. More precisely there is a statistically significant difference in the T-test and 9-3-6-3-9 tests for the U-11 group (p - .002, .012, respectively) and for the U-19 group (p - .017, .026, respectively). The U-14 group did not show a difference mainly because being shorter can sometimes be an advantage due to shorter legs and the time needed to avoid obstacles (in this case cones) (Little & Williams, 2003). Peña-González et al. (2021) supported these results by showing no difference in the U-14 group in agility. Lovell et al. (2015) contrasted this by finding a difference for the U-14 and no difference for the U-10 and U-18 groups. The main difference between the studies is that Lovell et al. (2015) had a sample of players playing in lower leagues and therefore it could be that these players did not go through a full selection process.

Relative age effect and dropout rate can generally be explained by the maturational theory outlined by Malina, Bouchard, & Bar-Or (2004). This theory indicates that there is a bias towards selecting boys who are accelerants (most often born in the first months of the year) and are maturational advanced (better anthropometric, cognitive and physical characteristics) in contrast to their peers born towards the end of the year. Also, it is well-known that players (kids) tend to stay more involved in sport where they are succesful and recognized (Deaner, Lowen, & Cobley, 2013). Regardless of the results of existing research, it shows a lower number of players born in the second part of the year without exception and that must be a clear sign that football experts are missing something.

The main limitation of this study is that it is not a longitudinal study with a single group of players followed throughout the process which would provide much more precise data on the dropout rate. Due to the very nature of football, such a study would be difficult to do due to the constant departures of football players and the arrival of new ones, unless it is a top elite club that can oblige their players with contracts and scholarships to stay at the club for years, and if the research starts when they are eleven years old and finish when they are nineteen it could be a completely different team and those data would not be relative. Also, future research should implement some variables for measuring biological and chronological maturation.

5. Conclusion

This study showed that the RAE exists among sub-elite young footballers. This difference, according to the number of represented players, is visible in all categories with a progressive increase as age increases. The difference in pre-pubescent players does not exist in the tested parameters as well as in players who are near the end of their physical development, while in players who are in puberty, more precisely in those who are near the end of PHV, there is a drastic difference between players born in the first and players born in the second half of the year in almost all the tested parameters. As the results showed, the biggest dropout happens after the age of 14, because until then, players who later reach football maturity had fewer playing chances and thus less progress, so their motivation decreases and they stop playing sports or change clubs. In addition, clubs bring in new players during the transition periods, who again make a difference in favor of players born in the first half of the year. The main conclusion of this paper is that all youth football players must be given the same chance because not everyone reaches full maturity at the same time in order to be competent until the PHV period is over for everyone. It is also further recommended that the leagues in the junior categories be divided into two parts (the league for footballers born in the first half of the year and the league for those born in the second half) so that everyone gets approximately the same playing chance.

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EFEKAT RELATIVNE STAROSTI STVARA DISKRIMINACIJU I PANDEMIJU OSIPANJA U OMLADINSKOM FUDBALU: DA LI SVI TREBA DA DOBIJU ISTU ŠANSU?

Cilj ove studije bio je da se utvrdi stopa osipanja i razlika između fudbalera rođenih u različitim polovinama godine. U ovoj studiji učestvovao je 101 subelitni fudbaler (14,4±2,9 god, 168,2±9,4 cm, 60,1±5,3 kg, 21,7±2,2 BMI) podeljenih u tri starosne kategorije i dve podgrupe za svaku kategoriju (U-11a/b, U-14a/b i U-19a/b). Razlika između podgrupa je procenjena korišćenjem T-testa za nezavisne grupe i Mann-Vhitney U testa sa statističkom značajnošću postavljenom na nivo p < .05. Testovi korišćeni u ovom istraživanju su: 10, 20 i 30 m, SJ, CMJ, CMJmax, T-test, 9-3-6-3-9 i Slalom. Statistička razlika za grupu U-11 dobijena je kod SJ (p = .002), T-testu (p = .012) i 9-3-6-3-9 testu (p = .002). U grupi U-14 statistička razlika je prikazana u svim testovima brzine i eksplozivne snage (p < .05). Parametar telesnih masti nije pokazao statistički značajnu razliku između grupa, dok se telesna visina, telesna masa i mišićna masa razlikuju na statistički značajnom nivou (p = .017, .041, .0.46 respektivno). U poređenju sa mlađim grupama, grupa U-19 pokazuje značajnu razliku na T-testu i trčanju na 10 m (p = .017, .037, respektivno). Glavni nedostatak ovog istraživanja je to što nije longitudinalnog karaktera sa jednom grupom koja bi se pratila tokom celog procesa. Zaključno, bilo bi poželjno da svi dobiju jednaku šansu zbog različite brzine razvoja kako bi bili kompetentni. Dalje preporuke su da se omladinske kategorije podele u dve odvojene lige kako bi svi imali isto vreme za igru.

Ključne reči: *period najvećeg rasta, adolescenti, performanse*