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The relative age effect on the selection of young athletes and the performance of Brazilian futsal teams

El efecto de la edad relativa en la selección de jóvenes atletas y el rendimiento de los equipos brasileños de fútbol sala

Efeito da idade relativa na seleção de jovens atletas e no rendimento de equipes brasileiras de futsal

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RESUMEN (150 palabras) (mismo orden que títulos)

Objetivo: El objetivo del presente estudio es evaluar el efecto de la edad relativa en la selección de los atletas jóvenes y el rendimiento de los equipos de fútbol sala. Métodos: Se recopiló la fecha de nacimiento de 2.676 jóvenes atletas (femeninos: n=292; masculinos=2.384) que jugaban en las categorías Sub-9 a Sub-20 de fútbol sala brasileño. Los atletas fueron categorizados en base al cuartil y al semestre de nacimiento. La posición final de los equipos en el torneo fue categorizada como finalista, semifinalista y no semifinalista. Se aplicó la prueba chi-cuadrada, el V de Cramer y los modelos de regresión logística multinómica. Resultados: Los datos apoyaron la hipótesis sobre la tendencia a seleccionar atletas que nacieron en los primeros meses del año en equipos masculinos, pero no se observó lo mismo en equipos femeninos. Además, sólo los atletas de la categoría Sub-13 que nacieron en el primer semestre del año presentaran un 50% de posibilidades de estar entre los finalistas del torneo cuando se comparan con sus compañeros. Aplicaciones prácticas: La edad relativa tuvo efecto en el equipo de atletas masculinos jóvenes, pero tal efecto no se asoció con el rendimiento positivo de los equipos de fútbol sala, excepto para la categoría Sub-13. Por lo tanto, se recomienda a los entrenadores de atletas jóvenes valorar otros factores en el momento para seleccionar y componer sus equipos dentro del contexto evaluado aquí.

Palabras clave: Maturación; Identificación de talentos; Desarrollo de jóvenes; Competición.

ABSTRACT (150 words) (same order that title)

Aim: The aim of the present study is to assess the effect of relative age on the selection of young athletes and the performance of futsal teams. Methods: The date of birth of 2,676 young athletes (female: n=292; male=2,384) playing in the U-9 to U-20 categories of Brazilian futsal was collected. The athletes were categorized based on quartile and on the semester of birth. The final position of the teams in the tournament was categorized as finalist, semifinalist and non-semifinalist. The chi-square test, the Cramer's V and multinomial logistic regression models were applied. Results: The data supported the hypothesis about the trend to select athletes who were born in the first months of the

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year in male teams, but it was not observed in female teams. Additionally, only athletes in the U-13 category who were born in the first semester of the year present 50% chance to be among the finalists in the tournament when they are compared to their peers. Practical application: The relative age had effect on the team of young male athletes, but such an effect was not associated with the positive performance of futsal teams, except for the U-13 category. Thus, coaches of young athletes are recommended to value other factors at the time to select and compose their teams within the herein assessed context.
Keywords: Maturation; Talent identification; Youth development; Competition.

RESUMO (1500 palavras) (mesma ordem como títulos)

Objetivo: O objetivo do presente estudo é avaliar o efeito da idade relativa na seleção de jovens atletas e o desempenho das equipes de futsal. **Métodos:** Foi coletada a data de nascimento de 2.676 jovens atletas (feminino: n=292; masculino=2.384) jogando nas categorias Sub-9 a Sub-20 do futsal brasileiro. Os atletas foram categorizados com base no quartil e no semestre de nascimento. As equipes foram agrupadas de acordo com a posição final no torneio como finalista, semifinalista e não semifinalista. Foram aplicados o teste de Qui-quadrado, V de Cramer e os modelos de regressão logística multinomial. **Resultados:** Os dados corroboraram a hipótese sobre a tendência de selecionar atletas nascidos nos primeiros meses do ano em equipes masculinas, mas isso não foi observado em equipes femininas. Além disso, apenas atletas da categoria Sub-13 que nasceram no primeiro semestre do ano apresentaram 50% de chance de estar entre os finalistas do torneio quando são comparados aos seus pares. **Aplicações práticas:** Houve efeito da idade relativa na seleção de jovens atletas do sexo masculino, mas tal efeito não esteve associado ao desempenho positivo das equipes de futsal, com exceção da categoria Sub-13. Assim, os treinadores de jovens atletas são recomendados a valorizar outros fatores no momento para selecionar e compor suas equipes dentro do contexto aqui avaliado.
Palavras chave Maturação; Identificação de talentos; Desenvolvimento de jovens; Competição.

INTRODUCTION

Sports tournaments for young athletes are often organized based on categories gathered according to year of birth, and it leads to conflicts among peers who were born in the same year, or within a 2-year time interval (Musch & Grondin, 2001). Thus, children born in January and December of the same year who compete to each other present differences close to one year of life, whereas this difference may mean approximately 20% of the total age of the young athlete in categories grouped every two years (Barnsley, Thompson, & Barnsley, 1985; Mujika et al., 2009). Since the 1980s, the literature provides information showing that coaches and sports managers tend to select athletes born in the first months of the year to participate in organized competitions and to be promoted to higher performance levels (Cobley, Baker, Wattie, & McKenna, 2009). Accordingly, although the age grouping usually adopted by the federations aims at promoting a balanced competition environment, such a criterion may mean advantages/disadvantages due to differences in chronological age among young athletes (Barnsley, Thompson, & Legault, 1992). This difference is known as relative age, and its consequences (participation and performance) are called relative age effect (RAE) (Musch & Grondin, 2001).

The consequences from the RAE and from its manifestations in sports modalities have been investigated and discussed in the literature for many years (Augste & Lames, 2011; Helsen, Van Winckel, & Williams, 2005; Steingröver, Wattie, Baker, & Schorer, 2016; Apollaro, Rodríguez, Herrera-Valenzuela, Hernández-Mendo & Falcó, 2022; González, Madinabeitia, Ureña & Alarcón, 2021; Leite, Borges, Santos & Sampaio, 2013; Saavedra García, Gutiérrez Aguilar, Galatti & Fernández Romero, 2015; Ortigosa-Márquez, Reigal, Serpa & Hernández-Mendo, 2018; Redondo, Fernández-Martínez & Izquierdo, 2019; Ferragut, Vila, Fernández-Romero, Saavedra García, 2021). Researchers have been suggesting explanations for the causes and consequences of the RAE on sports based

on different approaches in the last decades (Cobley et al., 2009; Hancock, Adler, & Côté, 2013; Wattie, Cobley, & Baker, 2008; Wattie, Schorer, & Baker, 2015). Wattie et al. (2015) take into account three fundamental aspects to understand this phenomenon in the model based on RAE embarrassments in sports, which concerned individual, task and environment embarrassment. In a brief and simplified way, this model organizes the understanding about RAE consequences and suggests that they must be understood through their interactions, rather than be interpreted in isolation. For example, a young soccer athlete who competes in the U-13 category, who was born right after the cut date and who is early in the maturation process will be likely benefited in its sports practice. Thus, individual features (relative age, maturation level) interact with task (strength and speed requirements for soccer) and environment features (high competitiveness since the youngest levels, cutting policy at age grouping), which results in supposed advantages that favor the individual. However, if this same individual was a gymnastics athlete - which favors individuals with late maturation and good physical flexibility ability, among others -, he/she could see him/herself under a disadvantageous condition. Several variables interact and change the RAE manifestation within this scenario, such as sex, regional culture, popularity and modality organization level, among other factors that change the practicing environment and the trends observed in it (Smith, Weir, Till, Romann, & Cobley, 2018; Wattie et al., 2015).

Although the RAE phenomenon has been broadly investigated in soccer (Augste & Lames, 2011; Helsen et al., 2005; Massa et al., 2014; Peña-González, Fernández-Fernández, Moya-Ramón, & Cervelló, 2018; Práxedes, Fernández-Fernández, Moya-Ramón, & Cervelló, 2017), studies about futsal only started being carried out lately (Carraco et al., 2020; Lago-Fuentes, Rey, Padrón-Cabo, Prieto-Troncoso, & Garcia-Núñez, 2020; Figueiredo, Seabra, Brito, Galvão & Brito, 2021). Important differences must be highlighted among modalities, mainly when it comes to the contribution from the anaerobic via to performance and regular physical confrontation situations, due to the reduced space available for this game (Beato, Coratella, & Schena, 2016). Futsal is a modality that requires high-intensity movements, accelerations, decelerations, and changes of direction, demanding high-level practitioners to develop characteristics of aerobic capacity, maximum speed, strength, lower limb power, and lean muscle mass (Spyrou, Freitas, Marín-Cascales & Alcaraz, 2020).

A recent study did not show RAE in athletes participating in the last three seasons of FIFA's Futsal World Cup (Carraco et al., 2020). It is important pointing out that the analyses carried out in the study did not show differences, not even in stratifications based on tournament edition (years: 2008, 2012 and 2016), function/position, associated confederation and final ranking in the tournament. Similar results were recorded for women playing in the elite of the Brazilian futsal by Ferreira et al. (2020). Based on the study by Lago-Fuentes et al. (2020) with players in the first Spanish division, there is the prevalence of athletes who were born in the last months of the year between the 2006-2007 and 2014-2015 seasons, mainly in mid- and high-quality teams, and in goalkeeper and pivot positions. The authors interpreted this finding based on the "underdog effect", by also taking into account the hypothesis that athletes could end up opting for futsal because they gave up a career in a more popular sports modality in the country, such as soccer. On the other hand, studies carried out by Morales Júnior et al. (2018) and Figueiredo et al. (2021) Brazilian and Portuguese futsal players showed the prevalence of athletes who were born in the first months of the year.

Briefly, the studies aimed at assessing RAE presence in futsal elite athletes have shown controversial outcomes (Carraco et al., 2020; Lago-Fuentes et al., 2020; Morales Júnior et al., 2018). However, one can observe a lack of studies about young futsal athletes focused on assessing RAE presence and its influence on sports performance. Such investigation types are needed, since the talent formation and identification process is becoming earlier in this sports modality (Vaeyens, Lenoir, Williams, & Philippaerts, 2008; Williams & Reilly, 2000). The fact that official futsal competitions adopt court dimensions and identical beacons in competitive categories – from the youngest levels to adults - is another reason pointing towards the importance of this type of analysis. Such a condition could worsen and give greater weight to likely advantages/disadvantages resulting from RAE, mainly in the younger categories. In addition to this factor, the aim of the current study was to assess RAE presence

and its impact on the sports performance of young futsal athletes.

METHODS

Sample

This study is an empirical investigation of transversal cohort and of an associative and predictive character (Ato, López, & Benavente, 2013). The study counted on public domain data available at the websites of the 27 Futsal Federations bond to the Brazilian Futsal Confederation. The search was carried out in May 2020 and took into account competitions that took place in each of them throughout 2019 at all youth categories (up to U-20). Inclusion criteria encompassed presenting the full name and birth date of athletes in each team; and presenting final result per team in each competition per category and sex. Federations that only presented part of this information, or that did not present any information were excluded from the study. After the inspection, only data from two Federations were included in the study: Federação Catarinense de Futsal (FCF), in Santa Catarina State; and Federação Gaúcha de Futsal (FGF), in Rio Grande do Sul State.

Procedures

An ad hoc spreadsheet was elaborated, and it totaled 2,676 athletes (female: n=292, all of them from FCF; male: n=2,384 – 1,638 athletes from FCF and 746 from FGF). Female teams participated in competitions encompassing categories from U-15 to U-20, thus totaling 19 teams; and male teams encompassed 140 teams that participated in competitions encompassing categories from U-9 to U-20, all at regional level, in both Federations (FCF: n=100; FGF: n=40). Athletes were categorized based on birth quartile in the spreadsheet (Q1: Jan-Mar; Q2: Apr-Jun. Q3: Jul-Sept; Q4: Oct-Dec) and on semester of birth (S1: Jan-Jun; S2: Jul-Dec). Another spreadsheet organized information about sports performance of each team based on category and sex. Final ranking of teams in each competition was also a categorized variable: a) finalists: first and second positions in the ranking; b) semi-finalists: third and fourth positions in it; c) non-semifinalists: other teams that did not even reached the semi-final phase.

Statistical analysis

The chi-square test was used to observe the relative age effect on each category and sex, and the Cramer's V - see formula of Cramér (1946) in Fritz, Morris, & Richler (2012) - was adopted to calculate the effect size. The scale 0.10–0.29, small; 0.30–0.49, moderate; ≥ 0.50, high was used to interpret the effect size (Cohen, 1988; Gravetter, Wallnau, Forzano & Witnauer, 2020). The analysis of the RAE relation based on the final sports results reached by each team in each category, it was possible getting to the conclusion of lack of multicollinearity - multinomial logistic regression models were also used. Multiple models were created to each category by adopting the final result of the competition as dependent variable; the quartile or the semester of birth were used as independent variable – the respective dummy variables were added to the model. The significance and likelihood of each model were analyzed by assuming alpha=0.05; Wald test was interpreted by adopting $p<0.05$ to accept β value different from zero; the odds ratio calculation was taken into consideration by assuming the interpretation of only chance of reliability intervals that did not contain 1. Data were assessed in SPSS software, version 25.

RESULTS

Athletes' distribution by quartile of birth in each category is presented in Table 1 (male) an in Table 2 (female). Data in Table 1 evidence that 66.19% of athletes were born between Q1 and Q2. The proof of standardized waste showed that frequencies observed in different categories are quite far from the expected in the two first birth quartiles ($Q>1.96$). However, differences were reversed and smaller in the last two quartiles ($Q<-1.96$). Differences remained in all categories when data were analyzed based on semester, and the standardized waste were equally significant. Thus, relative age had significant impact on the composition of the analyzed categories. With respect to the magnitude of the effects, it is possible stating that, except for the U-15 category – which presented small effect -, all categories presented moderate effect size. Table 2 points out that 57.19% of girls were born between Q1 and Q2, and that there was no relative age effect on the composition of female teams; this finding shows that this is not sports selection variable in the assessed categories.

Table 1. Observed frequencies and relative percentages by quartile and semester of birth, and the effect of relative age by category on male players.

	Birth quartile					Statistics test			Standardized residual			
Age group	**Q1 n (%)**	**Q2 n (%)**	**Q3 n (%)**	**Q4 n (%)**	**total**	**χ^2**	**p**	**Effect size***	**Q1**	**Q2**	**Q3**	**Q4**
U-09	171 (40.8)	125 (29.8)	78 (18.6)	45 (10.7)	419	86.72	.001	.455	66.3	20.3	- 26.8	- 59.8
U-11	218 (39.2)	158 (28.4)	101 (18.2)	79 (14.2)	556	83.78	.001	.388	79.0	19.0	- 38.0	- 60.0
U-13	192 (37.6)	145 (28.4)	102 (20.0)	72 (14.1)	511	64.16	.001	.354	64.3	17.3	- 25.8	- 55.8
U-15	114 (33.1)	101 (29.4)	77 (22.4)	52 (15.1)	344	26.11	.001	.276	28.0	15.0	- 9.0	- 34.0
U-17	134 (35.4)	106 (28.0)	81 (21.4)	58 (15.3)	379	33.84	.001	.299	39.3	11.3	- 13.8	- 36.8
U-20	60 (34.3)	54 (30.9)	39 (22.3)	22 (12.6)	175	19.76	.001	.336	16.3	10.3	- 4.8	- 21.8

	Birth semester			*Statistics test*			Standardized residual	
Age group	**S1 n (%)**	**S2 n (%)**	**total**	**χ^2**	**p**	**Effect size***	**S1**	**S2**
U-09	296 (70.6)	123 (29.4)	419	71.43	.001	.413	86.5	- 86.5
U-11	376 (67.6)	180 (32.4)	556	69.09	.001	.353	98.0	- 98.0
U-13	337 (65.9)	174 (34.1)	511	51.99	.001	.319	81.5	- 81.5
U-15	215 (62.5)	129 (37.5)	344	21.50	.001	.250	43.0	- 43.9
U-17	240 (63.3)	139 (36.7)	379	26.92	.001	.266	50.5	- 50.5
U-20	114 (65.1)	61 (34.9)	175	16.05	.001	.303	26.5	- 26.5

*Effect size (Cramer's V: $p<0.05$)

Table 2. Observed frequencies and relative percentages by quartile and semester of birth, and the effect of relative age by category on female players.

	Birth quartile					*Statistics test*		
Age group	**Q1 n (%)**	**Q2 n (%)**	**Q3 n (%)**	**Q4 n (%)**	**total**	**χ^2**	**p**	**Effect size***
Sub-15	35 (32.4)	28 (25.9)	24 (22.2)	21 (19.4)	108	4.074	0.254	0.194
Sub-17	34 (27.2)	34 (27.2)	32 (25.6)	25 (20.0)	125	1.752	0.625	0.118
Sub-20	16 (27.1)	20 (33.9)	14 (23.7)	9 (29.0)	59	4.254	0.235	0.268
	Birth semester					*Statistics test*		
Age group	**S1 n (%)**		**S2 n (%)**		**total**	**χ^2**	**p**	**Effect size***
Sub-15	63 (58.3)		45 (41.7)		108	3.00	0.083	0.167
Sub-17	68 (54.4)		57 (45.6)		125	0.97	0.325	0.088
Sub-20	36 (61.0)		23 (39.0)		59	2.86	0.091	0.203

*Effect size (Cramer's V: $p<0.05$)

There were no significant differences between the male and female sexes in the birth quartiles in the U-15 (χ^2=1.307; df=3; p=0.438); U-17 (χ^2=3.904; df=3; p=0.272) and U-20 (χ^2=1.107; df=3; p=0.775) categories. There were also no significant differences between sexes in each category if one takes into consideration the semester of birth (U-15: χ^2=0.603; df=1; p=0.727; U-17: χ^2=3.150; df=1; p=0.076; U-20: χ^2=0.326; df=1; p=0.568).

When male athletes' data were compared based on quartile between each Federation (FCF and FGF), it was not possible observing significant differences in most categories (U-9: χ^2=5.829, df=3, p=0.443; U-11: χ^2=1.480, df=3, p=0.687; U-13: χ^2=2.921, df=3, p=0.404; U-17: χ^2=1.223, df=3, p=0.748; U-20: χ^2=3.472, df=3, p=0.324), except for the U-15 category (U-15: χ^2=8.370, df=3, p=0.039), whose difference was exclusively observed in the distribution of the third quartile. The occurrence observed for SC (55) was higher than the expected (44.1), whereas the one observed for RS (22) was lower than the expected (32.9). Because of the similarity between states, option was made to work with data of both states, altogether, throughout the study.

The multinomial logistic regression models were run independently for each category by taking into account the performance of each team in the competition in comparison to the number of athletes born in each quartile or semester. This stage only considered information of male athletes, given the non-RAE of female athletes. The adjustment and likelihood ratio test of the models were not significant in almost all cases (Table 3). Category U-13 was the only exception when the dummy variables of the semester of birth were observed. There was 50% chance of athletes born in the first semester to be among the finalists in the competition in comparison to athletes who were born in the second one, when it comes to belonging to one of the teams that were not classified to the semifinals in the same competition (Table 4). The model based on teams in the semifinal group also presented significant likelihood ratio test for the U-13 category (Table 3); however, the significant values recorded in the Wald test highlighted that the β value was not different from

zero in any of the two groups in comparison to the reference group (Table 4), thus, the model cannot be interpreted.

Table 3. Adjustment and likelihood ratio testing of final models for each category, with dummy variables from the quartiles and semesters of birth - reference to finalist and semifinalist groups.

	Birth quartile				Birth semester			
Age group	**Likelihood log-2**	**χ^2**	**df**	**p value**	**Likelihood log-2**	**χ^2**	**df**	**p value**
Finalist group as reference								
U-9	34.313	3.167	6	0.788	20.081	0.426	2	0.808
U-11	35.540	8.083	6	0.232	20.688	4.160	2	0.125
U-13	34.438	7.736	6	0.258	20.535	6.153	2	0.046
U-15	34.852	3.082	6	0.798	20.280	0.929	2	0.629
U-17	36.136	2.920	6	0.819	20.862	0.037	2	0.982
U-20	30.386	12.100	6	0.060	18.125	4.289	2	0.117
Semifinalist group as reference								
U-9	34.313	3.167	6	0.788	20.081	0.426	2	0.808
U-11	35.540	8.083	6	0.232	20.688	4.160	2	0.125
U-13	35.438	7.736	6	0.258	20.535	6.153	2	0.046
U-15	34.852	3.082	6	0.798	20.280	0.929	2	0.629
U-17	36.136	2.920	6	0.819	20.862	0.037	2	0.982
U-20	30.383	12.100	6	0.060	18.125	4.289	2	0.117

Table 4. Multinomial regression models of the U-13 category, considering dummy variables of quartiles and semesters of birth.

Group	Variable	β	Error	Wald	df	Sig.	Exp (β)	Exp (β) IC (95%)
Finalist group as reference								
Semifinalist	Intercept	0.302	0.320	0.893	1	0.345		
	S1	-0.683	0.379	3.255	1	0.071	0.505	0.240 to 1.061
	S2	0*			0			
Non-semifinalist	Intercept	2.065	0.257	64.307	1	0.000		
	S1	-0.695	0.295	5.542	1	0.019	0.499	0.280 to 0.890
	S2	0*			0			
Semifinalist group as reference								
Finalist	Intercept	-0.302	0.320	0.893	1	0.345		
	S1	0.683	0.379	3.255	1	0.071	1.980	0.943 to 4.158
	S2	0*			0			
Non-semifinalist	Intercept	1.762	0.226	60.970	1	0.000		
	S1	-0.012	0.282	0.002	1	0.966	0.988	0.568 to 1.717
	S2	0*			0			

OBS: S1: birth in the first semester; S2: birth in the second semester; *: redundant value.

DISCUSSION

The aim of the current study was to assess RAE presence and its impact on the sports performance of young futsal athletes. The main results have shown trend to select athletes who were born in the first months of the year for competitions to male athletes, but it was not identified in female teams. When it comes to RAE influence on sports performance, it was possible observing that athletes in the U-13 category who were born in the first semester presented 50% chance to be among the finalists in the competition when they were compared to their peers who were born in the second semester, who belonged to teams that were not classified to the semifinals in the same competition. However, this finding was not observed for the other categories.

RAE presence in the sports selection process

RAE presence in the sports selection process in all categories of male teams is an important factor to be taken into consideration, since it was possible observing that this effect is stronger on lower categories, between U-9 and U-13. This is a relevant finding, since this chronological difference is more representative at younger ages, because of the young age itself and of the reduced sports experiences of young athletes. This chronological difference between boys in the age group 7-9 years (U-9 category) can represent approximately 20% of the total age of young athletes. With respect to anthropometric variables, previous studies have shown that between the age of 7 and 9 years, children present difference close to 12cm in height and to 10Kg of body mass (Silva, Pelegrini,

Petroski, & Gaya, 2010). These physical differences resulting from the chronological age can be advantageous for the ones who were born in the first months of the year in the futsal modality, if one takes into consideration the features of this game regarding the large number of body contacts, use of strength and often moves made at extreme speed (Beato et al., 2016). A condition that worsens these physical differences is related to official futsal competitions in which court dimensions and the dimensions of goals identical to those of competitive categories are adopted, from younger categories to adult players. Teams with mean height and higher strength level in the younger categories can benefit from such a physical advantage at situations like kicks and higher shots on goal (Figueiredo, Coelho and Silva, & Malina, 2011; Andronikos, Elumaro, Westbury, & Martindale, 2016), be it due to greater strength/ability to put the ball up or the smaller structure of the opposing goalkeeper. Another condition that can represent an advantage is related to features of the game added to the younger ages (Garganta, 1994), and it favors young athletes who have higher strength and power levels, because body contacts are more frequent at these situations.

RAE impact on the sports performance

Apparently, the present study is the first to assess RAE and its impact on the sports performance in teams of young futsal athletes. When it comes to professional athletes, results similar to the current ones were found in the study by Morales Júnior et al. (2018) who assessed the prevalence of Brazilian athletes who were born in the first months of the year and who participated in the 2014 national tournament. However, the trend observed in the results seems to be changed when the assessed group concerns professionals in the first division of the Spanish Federation and in world futsal tournaments (Carraco et al., 2020; Lago-Fuentes et al., 2020). If, on the one hand, Carraco et al. (2020) did not observe RAE in the 2008, 2012 and 2016 editions of the Futsal World Cup, the study by Lago-Fuentes et al. (2020) not just observed the presence of RAE, but also observed the prevalence of athletes who were born in the second semester of the year who played the elite Spanish tournament for five seasons in the role (between 2006-2007 and 2014-2015). Once featured as reverse RAE, the main argument set by the authors is focused on the popularity of this modality in the country, where soccer has the largest number of practitioners in comparison to futsal (Lago-Fuentes et al., 2020). Thus, athletes who would not be selected to keep on competing in soccer migrate to futsal practices in order to go on in their sports career. Results found by Práxedes et al. (2017) have shown the prevalence of births in the first months of the year among Spanish soccer athletes coming from the base categories of professional teams, and it reinforces the hypothesis about the influence of popularity on the practiced modality. Since there is greater competitiveness for the ascension in soccer and, therefore, a trend for RAE occurrence, it is reasonable speculating that younger athletes (within the cohort) tend to migrate to futsal.

However, a peculiar aspect that deserves attention refers to possible advantages favoring athletes who were born in the second semester, as cognitive and tactical skills development (Teoldo, Garganta, Greco, Mesquita, & Seabra, 2010; Machado, Scaglia, & Teoldo, 2015). So, it is necessary analyzing the literature available about soccer given the scarcity of research on this topic in the futsal field. With respect to performance, a study conducted by Teoldo et al. (2010) with soccer players shows association between month of birth and performance in the defensive tactical principles of young Portuguese athletes between categories U-11 and U-17. Based on the results, players who were born in the first semester presented advantages concerning the performance of tactic actions related to the specificity of tactic principles of the defensive phase, which are more demanding in physical terms than the tactic principles of the offensive phase (Teoldo et al., 2010). If one takes into account the proximity between soccer and futsal, it is possible speculating that athletes who were born in the second semester have the need of developing other skills in order to "survive" in the modality, since they would be at physical disadvantage. Thus, one of the ways to keep on practicing a sports modality would lie on developing a higher performance level in the game's offensive phase (Machado & Costa, 2016; Machado et al., 2015). It would be possible when younger players were encouraged to find solutions for game embarrassment from the tactic dimension perspective (mainly in the offensive phase) to the detriment of developing greater physical ability and defensive

tactic actions performed by older players (Machado & Costa, 2016; Machado et al., 2015).

Although studies have already shown different distributions regarding athletes' month of birth, they seem to corroborate the impact RAE has on sports performance. Although there is no record of RAE influence on sports performance in international tournaments (Carraco et al., 2020), the study by Lago-Fuentes et al. (2020), which was carried out with adult players, showed that teams that have reached the best positions in the final ranking of the tournament were mostly composed of athletes who were born in the second semester when they were compared to teams that were classified or that were downgraded in the competition. As Lago-Peñas et al. (2018) stated, athletes may end up opting for futsal because they gave up their career in a sport that has greater competition, in which there is an effect of relative age, such as soccer. Moreover, when it comes to RAE and its impact on the long-run, the recent literature review carried out by De la Rubia, Lorenzo-Calvo, & Lorenzo (2020) showed that relatively older athletes seen as talented often reach higher excellency levels in terms of competitive experience (Carling, Le Gall, Reilly, & Williams, 2009), longevity in their careers (Jones, Lawrence, & Hardy, 2018) and positioning in the ranking (Ford & Williams, 2011). However, younger athletes show the impact of RAE on short-term performance indicators, which is mainly supported by immediate performance criteria aimed at predicting the athletes' performance development (De la Rubia et al., 2020). Based on a sample encompassing young athletes, the current results evidence lack of RAE impact on competitions' results, except for the U-13 category. This category recorded 50% chances for athletes who were born in the first semester in comparison to athletes who were born in the second one to be among the finalists in the competition when it comes to belonging to teams that were not classified to the semifinals in the same competition. Assumingly, the biological maturation process of young athletes is the factor increasing physical differences, mainly at this age group. It is about this age the growth reaches its peak and physical advantages resulting from relative age can be increased – they depend on timing and tempo of each individual (Malina, Bouchard, & Bar-Or, 2004).

RAE in female athletes

The recorded results were similar to other in studies carried out with professional athletes who play the Brazilian (Ferreira et al., 2020; Morales Júnior et al., 2018) and Portuguese futsal tournaments (Figueiredo, Seabra , Brito, Galvão & Brito, 2021). Only in U-9 category a significant RAE was detected (Figueiredo, Seabra , Brito, Galvão & Brito, 2021). These studies did not find differences in the month of birth of female athletes in other categories. Altogether, these findings seem to point out that the month of birth is not a factor conditioning the sports selection process among women. Based on the study by Ferreira et al. (2020) conducted with professional athletes, it is interesting observing that, although female athletes who were born in the first semester presented longer practice time (1st semester = 9.9 ± 4.6 years; 2nd semester = 8.0 ± 3.7 years; $p = 0.014$), the time to start in the modality was similar (1st semester = 12.6 ± 3.7 years; 2nd semester = 13.4 ± 3.4 years; $p = 0.233$). Based on such data, it is possible observing that, on average, girls start the sports practice in futsal after the menarche period, which often happens at the age of 12 (Tanner, Whitehouse, & Takaishi, 1966). This information, in its turn, helps explaining the present findings since the analyzed categories are composed of girls at the age of 13, at most. Some factors that may contribute to a late start in futsal practice include physical demands of the game (strength and power for movements, agility and speed), cultural consequence of the lack of practice stimuli, difficult access to qualified practice, etc.

CONCLUSIONS

Briefly, the present finding points towards the RAE on the sports selection process in all male categories and this effect is more significant in the younger categories – U-9 to U-13. Female teams did not present the relative age effect in any of the assessed categories. There were no differences between sexes in terms of RAE, as well as there was no difference between the assessed contexts (FCF and FGF). The RAE analysis about sports performance of the analyzed teams did not evidence chances for the birth quartile to differentiate the finalist, semifinalist or non-classified teams for the semifinals in each category. This result was confirmed in almost all situations when the dummy variables of the semester of birth were taken into account. The only exception was the U-13 category, which showed 50% chance for athletes who

were born in the first semester to be among competition finalists in comparison to the one who were born in the second semester, because of being in teams that were not classified for the semifinals of the same competition. This age group is associated with the time when growth reaches its peak, whose change in the maturation stage has impact on different changes in the body of these athletes. These results point out that the birth quartile, although highlighted as factor for the sports selection of non-elite futsal athletes in Southern Brazil, it is not a factor associated with the sports success of teams.

PRACTICAL APPLICATIONS

To coaches of young male futsal athletes, we recommend that they be aware of the possible consequences of RAE, especially in the younger layers. One of these consequences can be represented by preferences in the selective process of initiation to sport for a stereotyped model of athlete, possibly by individuals who are advanced in the maturation process, valuing individuals who are advanced in the maturation process, characterized by a stronger and faster profile. In futsal, when compared to soccer, the playing field is reduced and these differences arising from the athlete's physical development can make a difference, as the number of duels and physical confrontations is frequent. This influence seems to be higher at age U-13, with even greater chances of obtaining better performance, which characterizes it as a critical age for the talent selection process. Therefore, we recommend that the criteria for selecting athletes to be related to the understanding and operationalization of the game, such as technical-tactical ones. Finally, for the coaches of young female futsal athletes, we recommend greater encouragement to practice and competition from the younger levels. It takes an effort from funding agencies to offer sports incentive sites and training centers with qualified teachers/coaches.

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