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Relative Age Effect: Relationship between Anthropometric and Fitness Skills in Youth Soccer

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Abstract

The aim of the study was to determine the relationship between anthropometric and fitness skills in youth soccer players according to their related age. The existence of relative age effect was also examined. Anthropometric as well fitness variables such as height, weight, BMI, body mass, flexibility, balance, reaction time, jumping ability, and endurance of the lower limb were assessed in 347 amateur young players. Participants' age ranged from 9 to 16 (M= 12.43, SD= 2.17). Analyses of variance indicated many significant differences among players of different birth quartile (from P< .001 to P< .05) for all the skills that were examined. The chi square test that was conducted to assess the distribution of players, showed that for all four different age groups no statistically significant difference was found regarding the birth quartile of players. In countries that training groups include 2 different age categories, anthropometric and fitness differences because of relative age effect are heightened. However, physical and physiological variables are inaccurate in predicting later success of players. Thus talent identification systems should provide equal opportunities for talented but related younger players. It is suggested an on-going talent identification using a multidimensional evaluation form including technical, physiological, physical, tactical, and psychological parameters.

Keywords: Coach, football, performance, physical, talent.

Introduction

Most of the sport organizations use systems of grouping athletes according to their chronological age so as to make the competition fairer. Usually, the cut-off date of players' categorization has been set as the first day of the year and usually two consecutive years determine each age category. That way, players with an age difference of 24 months is possible to train together in the same age group.

The difference in chronological age is referred to as the relative age and the results as the Relative Age Effect (RAE). The RAE is also related to the academic performance and there are significant cognitive differences among classmates according to their dates of birth. Thus, younger children face more academic difficulties compared to their older classmates (Bisanz, Morrison, & Dunn, 1995; Hauck & Finch, 1993). In sports, the most of the talent identification systems ignore RAE findings. In soccer for instance an over-representation of players is displayed that are born early in the selection years (Augste & Lames, 2011; Meylan, Cronin, Oliver, & Hughes, 2010; Vaeyens, Philippaerts, & Malina, 2005). Talent identification is a complex multivariate process which includes the evaluation of technical, anthropometrical, psychological, physiological, cognitive, and social variables (Hoare & Warr, 2000; Martindale, Collins, & Daubney, 2005; Reilly, Williams, Nevill, & Franks, 2000). However, the procedure is more often focused on players that are physically matured (Augste & Lames, 2011; Sherar, Baxter-Jones, Faulkner, & Russell, 2007). Youngsters that are physically more matured are also identified as gifted and more frequently enrolled in top clubs and in national teams (Gioldasis, Bekris, Michelinakis, Gissis, & Komsis, 2013; Williams, 2010). Enrolment in elite teams is often related to more positive effects such as increased competitive conditions, expertise training, increased playing time, and improvement of competence, self-efficacy and self-esteem perceptions (Bandura, 1986; Cobley, Baker, Wattie, & McKenna, 2009; Dixon, Horton, & Weir, 2011; Vaeyens et al., 2005; Vincent & Glamser, 2006; Thompson, Barnsley, & Battle, 2004). This cyclic relationship between the relative age effect and its positive effects grows the discriminations between relatively younger and older players.

Links between the RAE and several factors which influence the talent identification have been identified. Higher dropping out rates for the relatively younger players have been revealed because of their psychological inability to compete with older players (Mush & Grondin, 2001; Thompson et al., 2004; Vincent & Glamser, 2006). Furthermore, older players have been overrepresented in game involvement parameters such as the number of selections and the minutes played (Vaeyens et al., 2005). Ashworth and Heyndels (2007) also concluded that relatively older players earn higher wages than the younger players.

However, soccer is a highly competitive sport and coaches work under pressure to achieve early success. Top soccer clubs adopt specialized training programs for academy players, whose selection and development is a priority in order to enhance the sporting and financial status of the club (Vaeyens et al., 2006). Therefore, scouts and coaches are in favor of physically mature players who are perceived as being more skilled (Malina, Bouchard, & Bar-Or, 2004; Malina et al., 2000; Schorer, Baker, Büsch, Wilhelm, & Pabst, 2009). Likewise the RAE has been attributed to anthropometric characteristics as well as fitness characteristics (Carling, Le Gall, Reilly, & Williams, 2009; Cobley et al., 2009; Musch & Grondin, 2001). Researchers credited the overrepresentation of older athletes due to their possible predominance of physical characteristics that play role in performance and credited also the players' maturation level (Musch & Grondin, 2001; Malina, Ribeiro, Aroso, & Cumming, 2007). Sherar and colleagues (2007) suggested that athletes can be considered as talented only because their anthropometric characteristics and their fitness performance and eventually be selected by their coaches.

In the recent past has been an interesting research on the relationship between monthly birth distribution, anthropometrics and fitness characteristics (Hirose, 2009; Carling et al., 2009; Gil et al., 2014; Deprez, Vaeyens, Coutts, Lenoir, & Philippaerts, 2012). Carling and colleagues (2009) investigated a possible RAE in maturity, anthropometrics and fitness in elite under 14 soccer players. A significant difference was found for height in favor of players born early in the selection year which is similar to the findings of other researchers (Sherar et al., 2007; Hirose, 2009; Torres-Unda et al. 2013). In contrast Malina and colleagues (2007) and also Deprez and colleagues (2013) found no significant differences but an overall tendency in favor of older athletes. Carling and his colleagues (2009) also found no significant differences for fitness parameters but a general trend that older players outperformed younger ones. A study conducted by Hirose (2009) examined the relationship between birth-month distribution, biological maturation and body size in elite adolescent soccer players. He confirmed the existence of RAE and he also showed that older players were taller compared to younger players.

Although in many cases there is no statistically significant difference between anthropometric characteristics and the relative age of the players, there is still an overrepresentation of those born early in the selection year (Hirose, 2009). Both Hirose (2009) and Carling and colleagues (2009) believe that even though the small representation of athletes born later in the selection year, their physical and biological maturation plays a key role to their selection in the team. It is their early development compared to others with the exact age that gives them the advantage of being in the selection. The past literature shows that also biological maturation can bias the quarter representation of players into a team.

The main focus of the present study was to examine any possible differences between anthropometric and fitness variables in relation with players' relative age. In Greece is common that clubs organize their academies in group that include two consecutive years. Therefore four different age groups were created and each group included players born two consecutive years. Moreover each group was divided into eight separate birth quarters. Finally it was examined the existence of RAE between age groups.

Methods

Participants

In the present study participated 347 Greek amateur young male soccer players. They were all members of Greek soccer club academies for the season 2013-2014. Participants' age ranged from 9 to 16 (M= 12.43, SD= 2.17). All of them were divided into 4 different groups of age (group 9-10; group 11-12; group 13-14; group 15-16). Furthermore each group was divided into eight quartiles ranging from Q1 as the oldest players of the group to Q8 as the youngest players of the group. Parents or guardians were notified of the research procedures, requirements, benefits, and risks before giving informed consent because the players were under the legal age of consent. A university Research Ethics Committee granted approval for the study.

Measurements

The measurements took place at the beginning of the season and anthropometric and fitness variables were recorded. The date of birth for each participant was also recorded. The procedure for each assessment is described in turn. All the measurements over the entire study were performed by the same researchers specialized in sport ergophysiology and sport psychology. The anthropometric variables that researchers measured were the height, weight, body fat percentage, Body Mass Index, and flexibility. The fitness variables were balance, endurance of the lower limb, jumping ability, 10m and 20m running speed for 9-12 year old players, 10m and 30m running speed for 13-16 year old players, agility, and reaction time to visual stimulus for both left and right feet.

Anthropometric variables

Weight (kg), BMI (kg) and body fat (%) were obtained by a weighting scale (BC1000, Tanita, Japan) which transmitted the results to a computer. Moreover, a cursor was placed on each participant's head so as to measure their height (cm). Flexibility was assessed by the sit and reach box which is a test that was first described by Wells and Dillon (1952) and is now widely used as a general test of flexibility. That test involves removing shoes, sitting on the floor with legs stretched out straight ahead. Participants place the soles of the feet flat against the box. Their knees are locked and pressed flat to the floor. Then with the palms facing downwards, and the hands on top of each other, they reach forward along the measuring line as far as possible. Researchers record the distance that is reached by the hand. That test measures the flexibility of the lower back and hamstrings.

Fitness variables

The portable device called the OptoJump System (Microgate, Bolzano, Italy) was used to measure the endurance of the lower limb, jumping, and reaction time to visual stimulus of each player. The OptoJump System is an optical measurement system consisting of a transmitting and receiving bar (one meter long each bar). These bars contain photocells, in a distance of 2 millimeters from the floor. Photocells communicate continuously from the transmitting bar to the receiving bar. The system detects any interruptions in communication between the bars and calculates their duration. Thus, makes it possible to measure the endurance of the lower limb by the mean height of 15 continuous jumps. Similarly, jumping ability was measured as the highest jump of three continuous efforts. Finally, the reaction time to visual stimulus was assessed by the mean flight time when the player reacts to the optical stimulus by raising his foot after three stimuli in a row for each foot. The reliability of this system was recently supported for abilities measurements (Glatthorn et al., 2011). Running speed was evaluated using 2 pairs of photocells (Microgate, RACETIME 2), placed on the beginning of the distance and in the end of the distance. Players 9-12 years old were measured on 10m and 20m sprint for running speed, while 13-16 years old players' were measured on 10m and 30m sprint running speed. The researchers recorded the best of the two trials for each player. Agility was measured using the Illinois agility run (Hastad & Lacy, 1994; Svensson & Drust, 2005). The test started with a player standing with one foot in front of the other at the starting line. On the command "Go", participants sprinted 9m, and turned back to the starting line. Then they swerved in and out of four markers, completing two 9m sprints. Finally to finish the agility course they had to run 9m go and return to the finishing line. The fastest value obtained from two trials with 3min recovery was used as the agility score. Time was measured with timing gates using photocells (Microgate, RACETIME 2) positioned at the starting and the finishing line. The balance was measured with the shark skill test (Gatz, 2009). The researchers construct a box which was consisted of 9 squares 30cm each of these. The participant has to stand on the center square on one foot, and hop inside each of the boxes in a row. Before each advancing he/she had to return to the center box. Participants practiced one time before the two trials for each foot. A researcher indicated the starting and finishing time. Furthermore, a researcher added a tenth of a second for every time the participants touching the lines of each box, not returning to the starting box and touching the ground with the non-hopping foot.

Procedure

The date of measurement was arranged at the beginning of the competitive season and before the first training. The tests were scheduled under standard conditions of time, light and temperature. Players also performed a standardized warm-up. Initially, researchers recorded the indoor tests (height, weight, body fat, BMI, flexibility, balance, reaction time, jumping ability, endurance of the lower limb) and then they recorded the outdoor tests (agility and running speed). The breaks between the trials were around 3-5 minutes.

Statistics

All statistical analyses were performed using the SPSS package (v. 17). A one-way ANOVA was conducted, in order to check if there were differences between quartiles for both anthropometric variables (height, weight, BMI, body fat) and fitness variables (reaction time, jumping ability, agility, balance left leg, balance right leg, running speed, and lower limp endurance). That was used for all 4 different age groups. Moreover a chi square was conducted for every age group in order to test if the quartiles were represented equally. Finally, descriptive statistics were conducted for all the variables according to the age and the birth quartiles.

Results

The following figures (1-2) show the descriptive statistics of anthropometric (height, weight, body fat, BMI, flexibility), and fitness variables (balance, lower limp endurance, reaction time, running speed, jumping, agility) for the different training groups according to the birth quartiles (Q1-Q8). The rates of balance, reaction time, running speed, and agility represent the time, so fewer rates correspond to better performance.

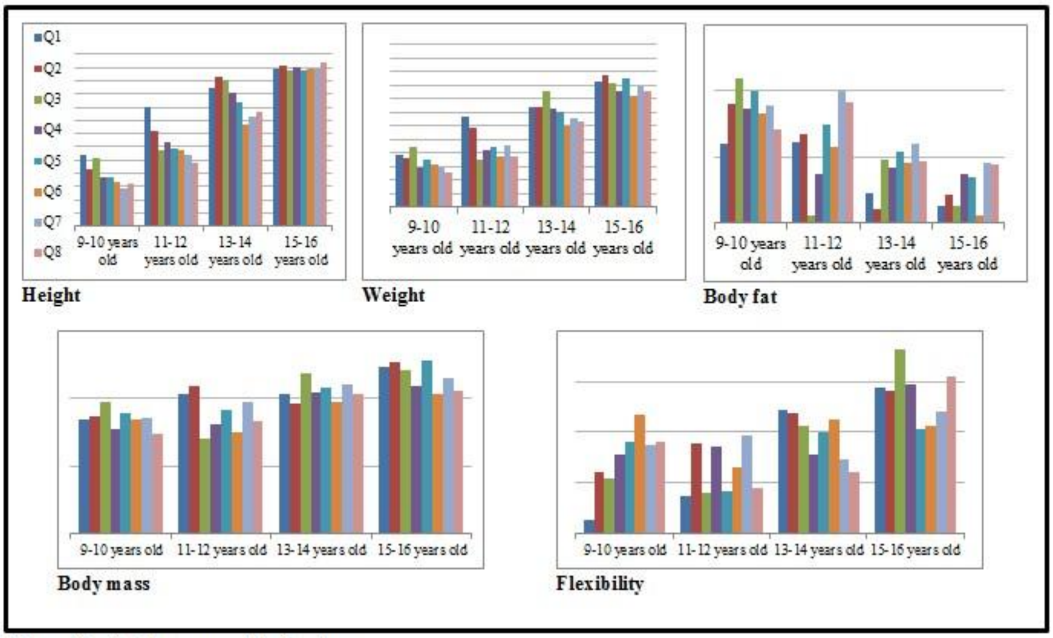

Figure 1 - Anthropometric factors.

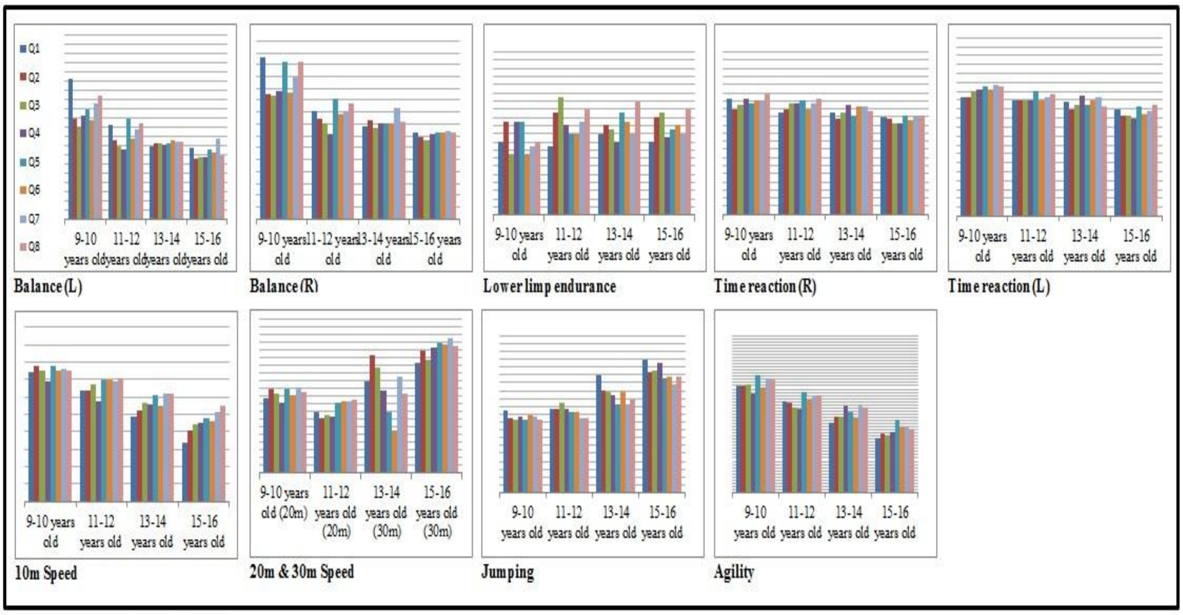

Figure 2 - Performance factors.

Relative age and anthropometrics

A one-way between subjects ANOVA was conducted to compare the differences among players according to their birth quartiles (tables 1-4). As far as the height it was found a significant difference between quartiles ($F_{(7,\ 64)}$= 4.21, *p*= .001) for players 9-10 years old. Thus, a Post hoc analysis using the Bonferroni test indicated that the mean score of players born on Q1 (*M*= 146.50, *SD*= 3.91) was significantly different than the one of players born on Q7 (*M*= 136.33, *SD*= 5.17; *p*< .05). Players born on Q3 (*M*= 145.50, *SD*= 5.34) were significantly different than players born on Q7 (*M*= 136.33, *SD*= 5.17, *p*< .001) and Q8 (*M*= 137.83, *SD*= 3.11, *p*< .05). It was also found a significant difference (p<.001) among players 11-12 years old ($F_{(7, 62)}$= 6.53, *p*= .001). Post hoc comparisons using the Bonferroni test indicated that the mean score of players born the Q1 (*M*= 160.94, *SD*= 10.61) were significantly different than the one of players born the Q3 (*M*= 147.92, *SD*= 4.03, *p*< .05), the Q4 (*M*= 150.38, *SD*= 3.22, *p*< .05), the Q5 (*M*= 148.61, *SD*= 4.31, *p*< .001), the Q6 (*M*= 147.85, *SD*= 5.51, *p*< .001), the Q7 (*M*= 146.61, *SD*= 3.96, *p*< .001), and the Q8 quartile (*M*= 144.38, *SD*= 5.13, *p*< .001). There was also a significant difference at height among players aged 13-14 years old ($F_{(7, 79)}$= 3.84, *p*= .001). Post hoc comparisons using the Bonferroni test indicated that the mean score of players born the Q2 (*M*= 170.27, *SD*= 10.17) was significantly different than the one of players born the Q6 (*M*= 155.79, *SD*= 8.88, *p*< .05). Furthermore, the mean score of players born the Q3 (*M*= 169.74, *SD*= 10.17) was significantly different than the one of players born the Q6 (*M*= 155.79, *SD*= 8.88, *p*< .05). Finally, there was not a significant difference among players aged 15-16 years old ($F_{(7, 46)}$= .11, *p*= .997). Regarding weight there was not a significant difference among players 9-10 years old ($F_{(7, 67)}$= 1.88, *p*= .087). However, there was a significant difference among players 11-12 years old ($F_{(7,62)}$= 4.56, *p*= .001). Post hoc comparisons using the Bonferroni test indicated that the mean score of players born on Q1 (*M*= 53.32, *SD*= 12.35) was significantly different than those born on Q3 (*M*= 37.28, *SD*= 5.90, *p*< .05), on Q4 (*M*= 40.94, *SD*= 4.59, *p*< .05), the Q6 (*M*= 38.44, *SD*= 5.87, *p*< .001), and on Q8 (*M*= 38.41, *SD*= 7.81, *p*< .05). Finally, there was not a significant difference among players aged 13-14 ($F_{(7, 79)}$= 1.72, *p*= .116) and 15-16 years old ($F_{(7, 46)}$= .79, *p*= .603). As far as the body fat there was not a significant difference among players 9-10 years old ($F_{(7, 67)}$= .68, *p*= .690). However, there was a significant difference among players aged 11-12 years old ($F_{(7,62)}$= 2.43, *p*< .05). Post hoc comparisons using the Bonferroni test indicated that the mean score of players born on Q3 (*M*= 10.53, *SD*= 3.76) were significantly different than the mean score of players born on Q7 (*M*= 20.01, *SD*= 6.09, *p*< .05). In addition There was not a significant difference among players 13-14 ($F_{(7, 79)}$= 1.16, *p*= .337), and 15-16 years old ($F_{(7, 46)}$= 1.13, *p*= .359). Analysis on BMI showed no significant difference among players 9-10 years old ($F_{(7, 67)}$= .76, *p*= .620). However, there was a significant difference among players 11-12 years old ($F_{(7,62)}$= 2.50, *p*< .05). However, after a post hoc using Bonferroni test there was not any significant difference between the quartile groups. Finally, there was not a significant difference among players 13-14 ($F_{(7, 79)}$= .86, *p*= .545) and 15-16 years old ($F_{(7,46)}$= 1.45, *p*= .209).

Relative age and fitness

On flexibility was found a significant difference between quartiles ($F_{(7, 64)}$= 2.65, *p*= .018) for players 9-10 years old. Post hoc comparisons using the Bonferroni test indicated that the mean score of players born on Q1 (*M*= 11.33, *SD*= 3.06) was significantly different than the one of players born on Q6 (*M*= 21.77, *SD*= 2.84, *p*< .05). Finally, there was not a significant difference among players 11-12 ($F_{(7, 62)}$= 1.36, *p*= .238), 13-14 ($F_{(7, 79)}$= 1.68, *p*= .127), and 15-16 years old ($F_{(7, 46)}$= 1.20, *p*= .323). Regarding balance there was not found any significant difference for left foot balance ($F_{(7, 66)}$= 1.38, *p*= .229) and for right foot balance [$F_{(7, 66)}$= 1.14, *p*= .347] among players 9-10 years old. The same result was found for balance on left foot ($F_{(7, 62)}$= 2.04, *p*= .063) and right foot ($F_{(7, 62)}$= 1.34, *p*= .247) among players 11-12 years old. No significant statistical difference was found left foot balance ($F_{(7, 79)}$= .16, *p*= .992) and right foot balance ($F_{(7, 79)}$= .94, *p*= .478) among players 13-14 years old, as well as no significant difference was found for left foot balance ($F_{(7, 46)}$= 1.52, *p*= .185) and for right foot balance ($F_{(7, 46)}$= .27, *p*= .961) among players 15-16 years old. On the lower limp endurance there was not any significant difference among players 9-10 years old ($F_{(7, 66)}$= 1.02, *p*= .424), among players 11-12 years old ($F_{(7, 52)}$= 1.14, *p*= .353), among players 13-14 years old ($F_{(7, 79)}$= 1.42, *p*= .208), and among players 15-16 years old ($F_{(7, 45)}$= .99, *p*= .452). On reaction time there was not a significant difference for right foot reaction time ($F_{(7, 67)}$= 1.87, *p*= .088) and left foot reaction time ($F_{(7, 67)}$= .99, *p*= .445) among players 9-10 years old. The same result was found for right foot reaction time ($F_{(7, 62)}$= 1.36, *p*= .237) and left foot reaction time ($F_{(7, 62)}$= 1.07, *p*= .392) among players 11-12 years old. However, there was a significant difference among players 13-14 years old for the right foot reaction time ($F_{(7, 79)}$= 2.77, *p*= .012), and left foot reaction time ($F_{(7, 79)}$= 2.14, *p*= .049) respectively. Post hoc comparisons using the Bonferroni test indicated that the right foot time reaction mean score of players born on Q2 (*M*= .47, *SD*= .03) was significantly different than the one of players born on Q4 (*M*= .54, *SD*= .07, *p*< .01). Finally, there was not a significant difference among players aged 15-16 years old, for right foot reaction time ($F_{(7, 46)}$= .58, *p*= .771), and for left foot reaction time ($F_{(7, 46)}$= 1.27, *p*= .288). As far as the running speed there was not a significant difference for 10m ($F_{(7, 67)}$= .46, *p*= .861), 20m ($F_{(7, 67)}$= .58, *p*= .770) among players 9-10 years old. Similarly there was not a significant difference for running spreed10m ($F_{(7, 62)}$= 1.27, *p*= .280) and 20m ($F_{(7, 62)}$= 1.53, *p*= .176) among players 11-12 years old. Although, there was not a significant difference among players 13-14 years old for 10m ($F_{(7, 79)}$= 1.74, *p*= .112), it was found a significant difference at 30m ($F_{(7, 79)}$= 2.56, *p*= .020)(table 21). Post hoc comparisons using the Bonferroni test indicated that the 30m running speed mean score of players born on Q2 (*M*= 4.53, *SD*= .57) was significantly different than the one of players born on Q6 (*M*= 3.55, *SD*= .20, *p*< .05). Finally, there was not a significant difference among players 15-16 years old, for 10m ($F_{(7, 46)}$= 1.65, *p*= .147), and 30m ($F_{(7, 45)}$= 1.42, *p*= .221). Regarding jumping ability there was not a significant difference among players 9-10 years old ($F_{(7, 67)}$= .37, *p*= .918) and among players 11-12 years old ($F_{(7, 62)}$= .94, *p*= .481). However, there was a significant difference among players 13-14 years ($F_{(7, 79)}$= 2.28, *p*= .036]. Post hoc comparisons using the Bonferroni test indicated that the jumping mean score of players born on Q1 (*M*= 22.45, *SD*= 3.50) was significantly different than the one of players born on Q5 (*M*= 27.97, *SD*= 4.99, *p*< .05). Finally, there was not a significant difference for players 15-16 years old ($F_{(7, 46)}$= 1.16, *p*= .346). Finally, on agility there was not a significant difference among players 9-10 years old ($F_{(7, 67)}$= .93, *p*= .488), 11-12 years old ($F_{(7, 62)}$= 1.06, *p*= .400). However, there was a significant difference among players 13-14 years old ($F_{(7, 79)}$= 2.18, *p*= .044), while no differences among quartile groups appeared. Finally, there was a significant difference among players 15-16 years old ($F_{(7, 45)}$= 2.76, *p*= .018). Post hoc comparisons using the Bonferroni test indicated that the agility mean score of players born on Q1 (*M*= 15.46, *SD*= .30) was significantly different than the one of players born on Q5 (*M*= 16.61, *SD*= .95, *p*< .05).

Table 1. Differences among players aged 9-10 years old according to their birth quartile.

9-10 years old			ANOVA		
Height	**SS**	**df**	**MS**	**F**	**p**
Between groups	685.051	7	97.864	4.210	.001
Within groups	1557.449	67	23.246		
Total	2242.500	74			
Flexibility					
Between groups	409.869	7	58.553	2.652	.018
Within groups	1479.217	67	22.078		
Total	1889.087	74			

Table 2. Differences among players aged 11-12 years old according to their birth quartile.

11-12 years old			**ANOVA**		
Height	**SS**	**df**	**MS**	**F**	p
Between groups	1644.417	7	234.917	6.531	.000
Within groups	2230.026	62	35.968		
Total	3874.443	69			
Weight					
Between groups	1965.219	7	280.746	4.559	.000
Within groups	3817.601	62	61.574		
Total	5782.819	69			
Body fat					
Between groups	460.143	7	65.735	2.426	.029
Within groups	1679.837	62	27.094		
Total	2139.979	69			
Body mass					
Between groups	112.855	7	16.122	2.498	.025
Within groups	400.131	62	6.454		
Total	512.986	69			

Table 3. Differences among players aged 13-14 years old according to their birth quartile.

13-14 years old			**ANOVA**		
Height	**SS**	**df**	**MS**	**F**	**p**
Between groups	1838.175	7	262.596	3.844	.001
Within groups	5396.945	79	68.316		
Total	7235.120	86			
Reaction Time (R)					
Between groups	.045	7	.006	2.773	.012
Within groups	.184	79	.002		
Total	.229	86			
Reaction Time (L)					
Between groups	.028	7	.004	2.141	.049
Within groups	.150	79	.002		
Total	.179	86			
Speed 30m					
Between groups	6.514	7	.931	2.562	.020
Within groups	28.700	79	.363		
Total	35.215	86			
Jumping					
Between groups	278.302	7	39.757	2.279	.036
Within groups	1378.456	79	17.449		
Total	1656.758	86			
Agility					
Between groups	12.760	7	1.823	2.184	.044
Within groups	65.946	79	.835		
Total	78.706	86			

Table 4. Differences among players aged 15-16 years old according to their birth quartile.

15-16 years old			**ANOVA**		
Agility	SS	df	MS	F	p
Between groups	7.471	7	1.067	2.759	.018
Within groups	17.410	45	.387		
Total	24.881	52			

Quartile representation

In order to test if the distribution of players was equal in each age group of players a chi square test for goodness of fit was conducted. The results showed that for all four different groups no statistically significant difference was found regarding the distribution of players.

Discussion and Conclusion

The aim of the present study was to examine the anthropometric and performance differences that may arise due to relative age in two consecutive years. Four age groups (9-10, 11-12, 13-14 & 15-16 years old) were examined from Greek amateur youth soccer academies. In addition the existence of the relative age effect was tested. Generally, significantly differences in anthropometrical and performance variables were found between older and younger players in favor of the older players. Additionally no overrepresentation of older players was confirmed. The most profound finding of the present study was found on height. Three out of four groups (9-10, 11-12 & 13-14) in the study showed that relative older players were significantly taller than younger ones. The present finding is a confirmation of several other studies conducted in the past (Carling et al., 2009; Deprez et al., 2012; Figueiredo, Gonçalves, Coelho e Silva, & Malina, 2009; Gil et al., 2014; Hirose, 2009; Sherar et al., 2007; Torres-Unda et al., 2013). The findings on weight showed a significant difference in age group 11-12 years old just like was found by Figueiredo and his colleagues (2009) and Torres-Unda and his colleagues (2013).

Additionally the findings revealed a tendency for age groups 9-10, 13-14 and 15-16 years old that older players tend to be heavier than younger ones. Although not significant Carling et al. (2007) found a similar result for young elite players. It was also found a significant difference on fat percentage for 11-12 years old players which was also found by Torres-Unda et al., (2013) but for players 13-14 years old. Other variables that the present study found significant differences were BMI (age group 11-12), flexibility for (age group 9-10; and tendency for age group 13-14). On fitness variables significant difference was found on 30m speed (age group 13-14) which was also found by Votteler & Hönera (in press). In addition agility (age group 13-14 and 15-16) and jumping ability (age group 13-14; and a tendency for 11-12) were found to be better for older players compared to younger. These results are in accordance with findings from previous studies (Gil et al., 2013; Votteler & Hönera (in press); Figueiredo et al., 2009). These differences between players in agility and jumping ability might be explained by the significant differences that were found initially in weight and height and their influence on performance. Lastly, more performance differences were found on left foot reaction time tendency (age group 11-12; 13-14), on right foot reaction time (age group 11-12; 13-14; and a strong tendency for 9-10). Figueiredo and colleagues (2008) argued that the variation in anthropometrics is linked to maturation level and that players with earlier maturation outperform players with less maturation on speed, strength and endurance (Malina, et al., 2004; Figueiredo et al., 2009). Perhaps that can explain our findings regarding several variables. Past literature has revealed significant differences and trends that support current findings. Nevertheless only two studies had non-elite players (Gil et al., 2013; Figueiredo et al., 2009) like the current study and several others had elite players (Hirose, 2009; Carling et al., 2009; Deprez et al., 2012; Deprez et al., 2013; Malina et al., 2007). Interestingly our findings match more to the two studies with non-elite players had more similar findings compared to studies that included elite players. Deprez and colleagues (2012) argued that no differences occurred due to a selection process that took place creating an homogenous sample. Thus we speculate that our findings in anthropometric and performance variables can be explained from the absence of such a selection. The absence of overrepresentation of older players was probably due to no previous selection process and that no players were excluded from the measurements and trainings. Cobley (Cobley et al., 2009) stated that the strongest overrepresentation was apparent at elite level but the sample of the current study came from non-elite amateur academies. That might give an explanation for the equally age distribution of players.

The reduction of anthropometric differences that occurred in the older training groups is explained by the growth spurt after the age of 12 years old (Stratton, Reilly, Williams, & Richardson, 2004). On the other hand, positive effects of playing and practicing more, stronger competitions, better and experienced coaching staff (Cobley et al., 2009; Vaeyens et al., 2005), greater perceptions of competence, self-esteem, less dropping out (Delorme, Boiché, & Raspaud, 2010; Thompson et al., 2004; Vincent & Glamser, 2006), explain differences of older training groups as far as the performance variables. In addition, relative younger players are obliged to compete older and stronger players, thus the only way to be competitive longitudinally is to improve other factors such as technical, tactical, and psychological characteristics (e.g. mental toughness and resilience). These findings support the hypothesis that relative younger players are sometimes as much or more talented than relatively older players.

Specifically, in a country like Greece that training groups include 2 different age categories, these differences are heightened. A reduction to the age group has already been proposed without significant positive effects (Brewer, Balsom, & Davis, 1995). The results showed no significant findings about overrepresentation of relative older players. That can probably be explained due to the non-elite nature of soccer academies as well as the absence of a pre-selection process. In contradiction many other studies that indicate the existence of RAE include elite players or players of (pre)selection players for a national team.

Furthermore, we are against to the subjective selection by a coach that demonstrates biases towards biological and physical maturation. This bias seems to be more problematic because physiological and physical variables are inaccurate in predicting later success of players (Le Gall, Carling, Williams, & Reilly, 2010). We suggest the development of evaluation norms including technical, physiological, physical, tactical, and psychological factors. Then an on-going talent identification using this form is proposed and the separation of players inside their training group according to their results.

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