COMPARISON OF AGILITY IN 13–16-YEAR-OLD VOLLEYBALL AND FOOTBALL PLAYERS AND NON-ATHLETES

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ABSTRACT

The aim of the study was to find and compare the agility abilities and anthropometric characteristics of 13–16-year-old volleyball and football players and adolescents not engaged in sports. The following research questions were posed: to find the agility results and anthropometric characteristics of volleyball and football players and non-athletes and to compare the agility results and anthropometric characteristics between athletes and not non-athletes and between different sports in both boys and girls. In total, 63 subjects participated in the study – 45 of them practised sports and 18 did not. Among those who practised sports, there were 19 volleyball and 26 football players. The following agility tests were applied in the study: T-test, four corners test, 5-0-5 run test and Illinois test. For data analysis, the Microsoft Excel program was used. The subjects' height, weight, fat percentage and fat amount were measured. The means, minimum and maximum values, standard deviations, and body mass indices were calculated. To find correlations within the groups, correlation analysis was used. To establish statistical significance between the groups, Student's t-test was used. The results revealed that, among both boys and girls, athletes were statistically significantly faster than non-athletes; only in Illinois test, there was no statistically significant difference. In girls, there were statistically significant differences between athletes and non-athletes in weight, fat percentage, fat amount and body mass index. In boys, however, there were no statistically significant differences in the body build characteristics between athletes and non-athletes. Football players were better in agility tests compared to volleyball players. Football boys were statistically significantly taller and older, and, in most tests, they were also statistically significantly faster than volleyball boys. Volleyball girls

were statistically significantly taller and weighed more, but, in all tests, football girls were statistically significantly faster than volleyball girls. In all groups, the fat-related indicators, like fat percentage, fat amount and body mass index, were in mutual correlation. According to the body mass index scale, 45 subjects were of normal weight, 6 were overweight, 1 was obese and 11 were underweight. The authors of the paper hold the view that, namely in this age group, the athletes of sports games should practice agility and be tested in it, as, according to literature, the development of agility slows down at the age of 16–17 years, and therefore, can be one of the obstacles for reaching the top in adult athletes.

Keywords: *agility; testing of agility; anthropometry*

INTRODUCTION

The vital factors in sports games are fast spurts and slowdowns, the ability of quick repositioning of the body, explosive strength and timing of movements. Psychophysiological properties like short anticipation time where the players are required quick understanding of what is happening around them, taking a decision and beginning counteraction are also essential. In sports games, reaction speed is the foundation for agility and speed of movement.

W. B. Young, R. James and I. Montgomery [1] have developed a scheme according to which agility consists of two big components. First, perception and taking of decisions, and second, speed of changing the direction. Perception and taking of decisions, in turn, is based on four factors: visual scanning, anticipation, recognition of patterns and recognition of situations. The speed of changing the direction is also based on four factors: technique (positioning of feet, adjustment of steps for acceleration and deceleration, body posture), linear sprint speed, anthropometric variables, and properties of leg muscles (strength, power, reactive strength).

According to L. Massuça and I. Fragoso [2], body mass can influence the athlete's speed, endurance and strength, while body composition can influence strength and agility. In other words, successful practice of both football and volleyball games requires from the players, along with high-level technical and tactical skills, fitting anthropometric properties and body composition.

It is expedient to practice and test adolescents' agility at the age of 13–16 years, as, according to literature, the development of this ability slows down at the age of 16–17 years [3], and therefore, can be one of the obstacles for reaching the top in adult athletes.

Considering the above, the aim of the current study was to find the agility abilities and anthropometric characteristics of 13–16-year-old volleyball and football players and non-athletes and to compare them.

MATERIAL AND METHODS

In total, 63 subjects participated in the study. There were 45 athletes, among them 19 volleyball and 26 football players. The number of non-athletes was 18. Among athletes, there were 24 girls and 21 boys, among non-athletes, 7 girls and 11 boys. The subjects included 13–16-year-old boys and girls practising volleyball and boys and girls of the same age who practised football and boys and girls aged 13–16 year who had not participated in any training groups in the last two academic years and only attended physical education classes at school. The volleyball players practise 3 times a week, football players 3–4 times a week, and non-athletes have physical education classes twice a week. The students and their coaches or teachers voluntarily agreed to participate in the study.

Four agility tests were conducted with the subjects: T-test, four corners test, 5-0-5 run test and Illinois test. Each student could have only one attempt in each test (except when s/he performed the test wrongly or fell during the test). Anthropometric measurements were also taken. The player's height (with the precision of 0.5 cm) and weight (on electronic scales with the precision of 0.01 kg) and body fat percentage (with the precision of 0.1%) and fat amount (with the precision of 0.1 kg) with body fat monitor Omron BF300 were measured. The procedure of the study was the following: filling the study card, anthropometric measurements, warm-up (10 minutes, the same for everyone) and then the tests: T-test, four corners test, 5-0-5 run test and Illinois test.

The tests were taken from the book *Developing Agility and Quickness* published by Human Kinetics. The authors of the book are Jay Dawes and Mark Roozen who have used the recommendations of many sports scientists, physiotherapists, and top-level coaches of different sports to devise special tests to assess the speed and agility of body movements [5]. The tests include turns, slowdowns and short spurts forward, backward, and sideways performed in a deficit of time.

For data analysis, the Microsoft Excel program was used. For the whole sample as well as within the groups of football and volleyball players and non-athletes, the maximum and minimum results, means, SD and BMI were calculated for both boys and girls. To find mutual correlations within the groups, correlation analysis in Microsoft Excel program was used. To compare

the mean results of the groups, Student's t-test was used. The level of statistical significance was set at p < 0.05.

RESULTS

Table 1 presents the subjects' means, standard deviations (SD) and minimum and maximum values of age, height, weight and fat indicators. Considering the means of the entire sample, the tallest were the football boys (180.62 cm) and the shortest the football girls (165.5 cm). The tallest boy among the subjects was a volleyball boy (193 cm) and the tallest girl a volleyball girl (186 cm). The mean height of all the boys was 177.86 cm. Football boys proved to be taller than the mean (180.62 cm). The mean height of all the girls was 168.48 cm. Volleyball girls proved to be taller than the mean (172.86 cm). The age of all the subjects ranged from 13 to 16 years. The mean weight of all the boys was 67.03 kg. Football boys (69.12 kg) and non-athlete boys (67.13 kg) were heavier than the mean. The mean weight of girls in the whole sample was 61.71 kg (Table 1). Volleyball girls proved to be heavier than the mean (69.01 cm). The mean fat percentage and fat amount in the boys of the entire sample was 17.96% and 12.44 kg respectively. Volleyball boys (19.25% and 12.86 kg) and non-athlete boys (18.33% and 12.85 kg) had higher fat percentage and fat amount indicators than the mean. The mean fat percentage and fat amount in the girls of the entire sample was 24.50% and 15.51 kg respectively. Only volleyball girls (26.62% and 18.79 kg) had higher fat percentage and fat amount indicators than the mean. The mean body mass index of the boys in the whole sample was 21.17 (Table 1). The body mass index of football boys (21.19) and non-athlete boys (21.60) was higher than the mean. In girls was, the mean body mass index of all the subjects was 21.68. The body mass index of football girls (21.89) and volleyball girls (23.05) was higher than the mean. Considering the body mass index, 45 subjects were of normal weight, or their BMI was in the range from 18.5–24.9. Six subjects were overweight, or their BMI was 24.9–29.9. One subject obese, or her BMI was more than 30, and 11 subjects were underweight with BMI less than 18.5.

Table 1. Means, SD, minimum and maximum values of subjects' age, height weight and fat indicators, n=63

Characteristics		Football players		Volleyball players		Non-athletes		Total	Total
		boys	girls	boys	girls	boys	girls	boys	girls
Variable	n=63	13	13	8	11	11	7	32	31
Age (y.)	Mean	15.77	15	14,5	14,36	14,18	13,86	14,91	14,52
	SD	0.439	1.291	1.069	1.12	1.168	1.069	1.146	1.235
	Min.	15	13	13	13	13	13	13	13
	Max.	16	16	16	16	16	15	16	16
Height (cm)	Mean	180.62	165.5	174.69	172.86	176.91	167.14	177.86	168.48
	SD	5.316	4.248	9.043	7.762	5.852	5.097	6.823	6.619
	Min.	169.5	158	163	161.5	171.5	159	163	158
	Max.	189	170.5	193	186	187.5	173	193	186
Weight (kg)	Mean	69.12	59.94	63.25	69.01	67.3	53.54	67.03	61.71
	SD	6.114	6.287	14.028	12.796	8.005	5.836	9.227	10.661
	Min.	57.2	49.2	47.9	45.6	54.1	46.7	47.9	45.6
	Max.	79.2	68.8	85.4	89.2	85.7	61.5	85.7	89.2
Fat (%)	Mean	16.86	24.13	19.25	26.62	18.33	21.86	17.96	24.50
	SD	4.278	3.389	7.83	5.166	8.327	2.67	6.654	4.272
	Min.	11.2	18.1	8.3	14.5	10.2	19	8.3	14.5
	Max.	23.8	29.2	29.3	35.4	36.5	26.6	36.5	35.4
Fat mass (kg)	Mean	11.84	14.64	12.86	18.79	12.85	11.99	12.44	15.51
	SD	3.848	3.415	7.35	6.332	7.599	2.616	6.068	5.155
	Min.	6.4	8.9	4.3	6.6	6.5	8.9	4.3	6.6
	Max.	17.7	20.1	23.4	31.6	31.3	16.2	31.3	31.6
BMI	Mean	21.19	21.89	20.56	23.05	21.60	19.15	21.17	21.68
	SD	1.649	2.291	3.236	3.944	3.213	1.749	2.629	3.177
	Min.	18.57	18.44	17.47	17.48	17.98	17.34	17.47	17.34
	Max.	23.78	26.11	26.97	30.87	28.63	21.74	28.63	30.87

The results of the four agility tests are shown in Table 2. Considering the entire sample, in T-test, the best results in boys were achieved by football boys – their group mean was 10.82 sec – and the weakest results by non-athlete boys, their group mean was 12.26 sec. The fastest boy in T-test was a volleyball boy (9.67 sec). In girls, the best results in T-test were achieved by football girls – their group mean was 11.19 sec – and the weakest results by non-athlete girls, their group mean was 12.48 sec. The fastest girl in T-test was a football girl (10.3 sec) (Figure 1).

Table 2. The results of agility tests (mean, SD, minimum and maximum values), n=63

| Characteristics		Football players		Volleyball players		Non-athletes		Total	Total
		boys	girls	boys	girls	boys	girls	boys	girls
Variable	**n=63**	**13**	**13**	**8**	**11**	**11**	**7**	**32**	**31**
T-test (sec)	Mean	10.82	11.19	12.14	11.96	12.26	12.48	11.65	11.75
	SD	0.863	0.508	1.930	0.505	1.024	0.879	1.395	0.787
	Min.	9.7	10.3	9.67	11.07	10.67	11.36	9.67	10.3
	Max.	12.57	12.26	15.14	12.6	13.51	13.74	15.14	13.74
4 Corner Test (sec)	Mean	9.62	10.35	10.37	11.45	10.88	11.71	10.24	11.04
	SD	0.482	0.472	1.173	0.919	0.992	1.057	1.016	0.984
	Min.	8.83	9.51	9.1	10.13	9.45	10.32	8.83	9.51
	Max.	10.3	11.42	12.51	13.7	12.23	13.76	12.51	13.76
5-0-5 Running Test (sec)	Mean	2.65	2.86	2.83	3.07	3.15	3.28	2.87	3.03
	SD	0.273	0.155	0.351	0.182	0.197	0.355	0.342	0.271
	Min.	2.36	2.67	2.36	2.73	2.89	2.89	2.36	2.67
	Max.	3.42	3.11	3.39	3.32	3.51	3.89	3.51	3.89
Illinois Agility Test (sec)	Mean	18.28	19.20	19.94	20.56	18.54	20.52	18.78	19.98
	SD	0.885	0.638	2.130	1.105	1.483	1.681	1.586	1.260
	Min.	17.04	18.04	17.54	18.89	16.54	17.98	16.54	17.98
	Max.	19.51	20.13	23.8	22.92	21.23	22.98	23.8	22.98
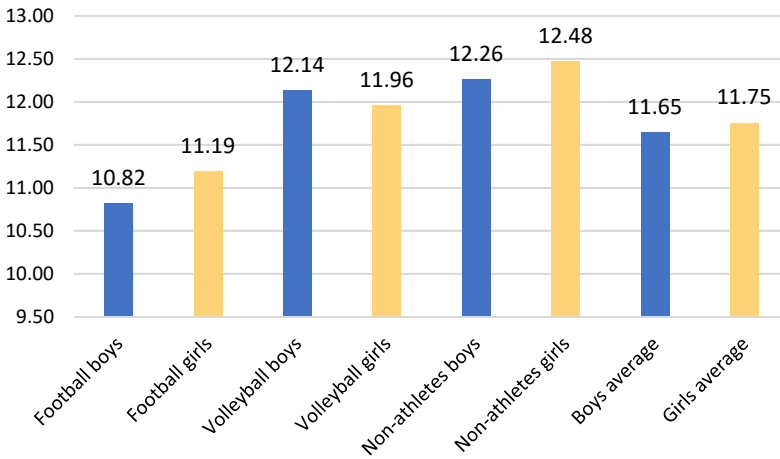
Figure 1. Mean results of T-test in boys and girls (sec)

In four corners test, the best results in boys were achieved by football boys with the group mean 9.62 sec and in girls by football girls whose group mean result was 10.35 sec. The weakest results in four corners test in boys were achieved by football boys with the group mean 10.88 sec and in girls by football girls whose group mean result was 11.71 sec. The fastest boy was a football boy with 8.83 sec and the fastest girl a football girl with 9.51 sec (see Figure 2).
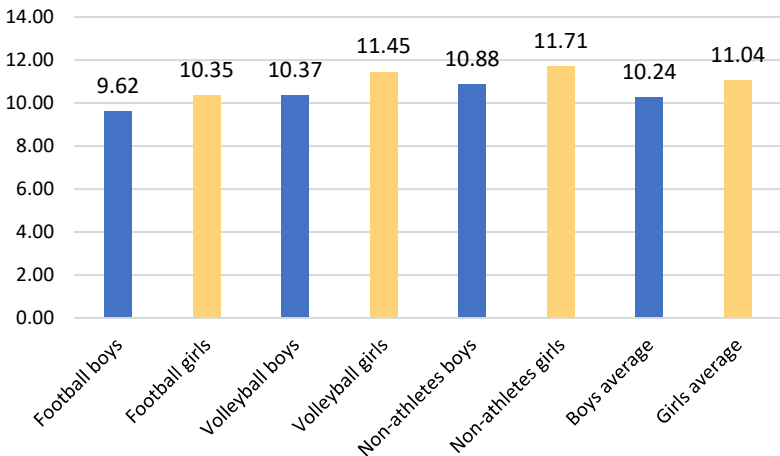
Figure 2. Mean results of four corners test in boys and girls (sec)

In 5-0-5 run test, the best results in boys were achieved by football boys with the group mean 2.65 sec and the weakest results by non-athlete boys whose group mean was 3.15 sec. In girls, the best results were achieved by football girls – their group mean was 2.86 sec – and the weakest results by non-athlete girls; their group mean was 3.28 sec. In boys, the fastest in 5-0-5 run test were a football boy and a volleyball boy with the same result 2.36 sec and in girls a football girl with 2.67 sec (see Figure 3).
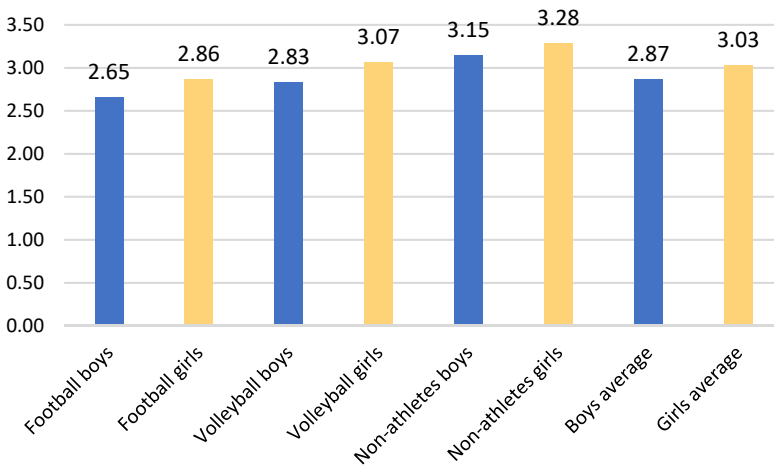

Figure 3. Mean results of 5-0-5 run test in boys and girls (sec)

In Illinois test, the best results in boys were achieved by football boys with the group mean 18.28 sec and the weakest results by volleyball boys whose group mean was 19.94 sec. In girls, the best results were achieved by football girls – their group mean was 19.20 sec – and the weakest results by volleyball girls; their group mean was 20.56 sec. The fastest boy in Illinois test was a non-athlete boy with 16.54 sec and the fastest girl a non-athlete girl with 17.98 sec (see Figure 4).

In agility test results, football boys and girls surpassed the mean results of the whole sample in T-test, four corners test, 5-0-5 run test and Illinois test the mean results of the whole sample in both boys and girls. In boys' 5-0-5 run test, volleyball boys also achieved better results among boys than the mean results of the entire sample. In boys' Illinois test, non-athlete boys also had better results than the mean of the entire sample.
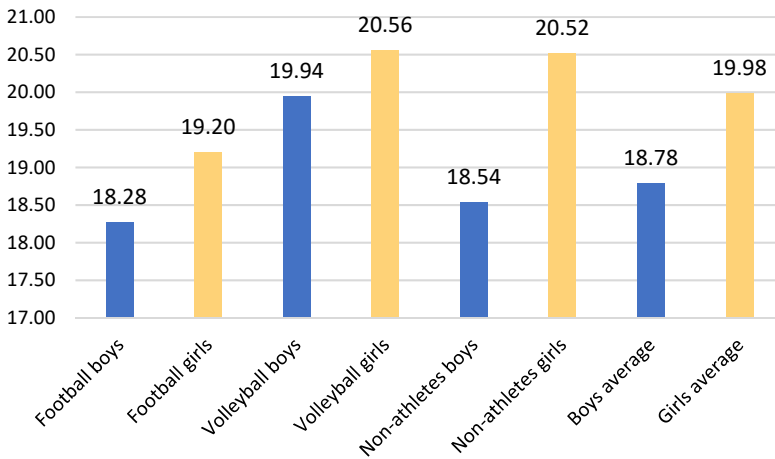
Figure 4. Mean results of Illinois test in boys and girls (sec)

Correlation analysis results revealed that the results of most tests were in mutually strong correlation (r = 0.70 – 0.98); in some cases, the correlation was negative, e.g., the increase in age brought about a decrease in the test time results. The four corners test results of non-athlete boys and girls and volleyball boys were in correlation with the results of 5-0-5 run test and Illinois test (r = 0.74 – 0.98). The T-test results of non-athlete boys and volleyball and football boys correlated with Illinois test results (r = 0.77 – 0.85). The 5-0-5 run test results in volleyball boys and girls were in correlation with Illinois test results (in boys r = 0.88 and in girls r = 0.74). The four corners test results of football girls were in correlation with T-test results (r = 0.66). There was an expected correlation between weight, fat percentage, fat amount and body mass index in all the groups (r = 0.75 – 0.93). Likewise, a correlation with the strength r = 0.74 – 0.98 was found in all the groups between fat percentage, fat amount and weight. The age of volleyball boys and non-athlete boys was in negative correlation with Illinois test results and four corners test results (r = −0.71 – −0.83). The age of non-athlete boys and girls was also in negative correlation with 5-0-5 run test results (in boys r = −0.74 and in girls r = −0.73).

To find correlations between groups, Student's t-test was performed. The comparison of boys' age, body build characteristics and agility test means are presented in Table 3. There were differences between football boys and volleyball boys in age – football boys were statistically significantly older (p = 0.000) and in height – football boys were statistically significantly taller (p = 0.036). There were also statistically significant differences in T-test results – football

boys were statistically significantly faster (p = 0.022), in four corners test results – football boys statistically significantly faster than volleyball boys (p = 0.025) and Illinois test results – football boys were statistically significantly faster than volleyball boys (p = 0.010).

The same table also shows the differences in the mean results of volleyball boys and non-athlete boys (Table 3). There was a statistically significant difference in 5-0-5 run test results – volleyball boys were statistically significantly faster than non-athlete boys (p = 0.011).

Table 3 also reveals the differences in the mean results between football boys and non-athlete boys. There were differences in age – football boys were statistically significantly older than non-athlete boys (p = 0.000), in T-test results – football boys were statistically significantly faster (p = 0.000), 5-0-5 run test results – football boys were statistically significantly faster (p = 0.000) and four corners test results – football boys were statistically significantly faster (p = 0.000).

Table 3 also shows the differences between the mean results of athlete boys (volleyball and football players) and non-athlete boys. There were differences in age – athletes were statistically significantly older (p = 0.003), in T-test results – athletes were statistically significantly faster (p = 0.035), 5-0-5 run test results – athletes were statistically significantly faster (p = 0.000) and four corners test results – athletes were statistically significantly faster (p = 0.000).

Table 3. Comparison of the means of boys' age, body build characterstics and agility tests results by Student's t-test

	Football vs volleyball	Volleyball vs non-athletes	Football vs non-athletes	Athletes vs non-athletes
Age	p=0.000559	p=0.275943	p=0.000078	p=0.003678
Height	p=0.036045	p=0.261642	p=0.059149	p=0.288501
Weight	p=0.099113	p=0.217397	p=0.266834	p=0.453149
Fat %	p=0.187215	p=0.404930	p=0.292110	p=0.413307
Fat mass	p=0.339124	p=0.499102	p=0.338082	p=0.393358
BMI	p=0.279011	p=0.248362	p=0.346473	p=0.258221
T-test	p=0.022157	p=0.429202	p=0.000576	p=0.035274
5-0-5 Running Test	p=0.100012	p=0.011663	p=0.000025	p=0.000132
4 Corner Test	p=0.025623	p=0.159155	p=0.000246	p=0.003664
Illinois Agility Test	p=0.010372	p=0.053485	p=0.299018	p=0.267753

*Statistically significant differences (p < 0.05) are shown in yellow.

The comparison of girls' age, body build characteristics and agility test means is presented in Table 4. The differences in means between football girls and volleyball girls were revealed in height – volleyball girls were statistically significantly taller than football girls (p = 0.003), in weight – volleyball girls were statistically significantly heavier (p = 0.017) and in fat amount, which was statistically significantly higher in volleyball girls (p = 0.026). Differences were also found in T-test results – football girls were statistically significantly faster (p = 0.000), in 5-0-5 run test results – football girls were statistically significantly faster (p = 0.003), in four corners test results – football girls were statistically significantly faster than volleyball girls (p = 0.000) and in Illinois test results – football girls were statistically significantly faster (p = 0.000).

Table 4. Comparison of the means of girls' age, body build characteristics and agility tests results by Student's t-test

	Football vs volleyball	Volleyball vs non-athletes	Football vs non-athletes	Athletes vs non-athletes
Age	p=0.107436	p=0.177803	p=0.030660	p=0.054848
Height	p=0.003736	p=0.052486	p=0.225504	p=0.275686
Weight	p=0.017035	p=0.004407	p=0.019683	p=0.009219
Fat %	p=0.085446	p=0.019882	p=0.071578	p=0.030795
Fat mass	p=0.026539	p=0.008249	p=0.045617	p=0.018646
BMI	p=0.190279	p=0.013231	p=0.006571	p=0.006914
T-test	p=0.000588	p=0.066516	p=0.000277	p=0.001938
5-0-5 Running Test	p=0.003125	p=0.055048	p=0.000772	p=0.001673
4 Corner Test	p=0.000519	p=0.291564	p=0.000393	p=0.019878
Illinois Agility Test	p=0.000557	p=0.477902	p=0.010060	p=0.101618

*Statistically significant differences (p < 0.05) are shown in yellow.

The same table also shows the differences in mean results between volleyball girls and non-athlete girls (Table 4). Differences were revealed in weight – volleyball girls were statistically significantly heavier (p = 0.004), fat percentage – volleyball girls' fat percentage was statistically significantly higher (p = 0.019), fat amount – volleyball girls' body fat amount was statistically significantly higher (p = 0.008) and body mass index – volleyball girls' body mass index was statistically significantly higher than in non-athletes (p = 0.013).

Table 4 also shows the differences in mean results between football girls and non-athlete girls. There were differences age – football girls were statistically

significantly older than non-athlete girls (p = 0.030), weight – football girls were statistically significantly heavier (p = 0.019), fat amount – football girls' body fat amount was statistically significantly higher (p = 0.045) and body mass index – football girls' body mass index was statistically significantly higher (p = 0.006). Differences were also found in all test results – football girls were statistically significantly faster than non-athletes in T-test results, 5-0-5 run test results, four corners test results and Illinois test results.

Table 4 also shows the differences in the mean results between athlete girls and non-athlete girls. Differences were revealed in weight – athletes were statistically significantly heavier (p = 0.009), fat percentage – athlete girls' fat percentage was statistically significantly higher (p = 0.030), fat amount – athlete girls' body fat amount was statistically significantly higher (p = 0.018) and body mass index – athletes' body mass index was statistically significantly higher (p = 0.006). Differences were also found in T-test results – athlete girls were statistically significantly faster than non-athlete girls (p = 0.001), 5-0-5 run test results – athlete girls were statistically significantly faster (p = 0.001) and four corners test results – athlete girls were statistically significantly faster (p = 0.019).

DISCUSSION

The study revealed that athletes were statistically significantly faster than non-athletes in agility tests – 5-0-5 run test, T-test and four corners test. This statistically significant difference was valid for both boys and girls. Only in Illinois test, no statistically significant difference was noticed between the groups of athletes and non-athletes.

When comparing our results in Illinois test with normative values for adults, we found that, based on a five-point scale (weak, moderate, medium, good, excellent), the mean result of boys in the entire sample was weak (18.78 sec). The best result was 16.54 sec and the weakest 23.8 sec. The girls' mean result for the whole sample on the Illinois test scale was medium (19.98 sec); the best result was 17.98 sec and the weakest result 22.98 sec. One of the reasons why our results seem modest on the Illinois test scale definitely is that the Illinois scale is meant for adult men and women [5]. When Illinois test results are compared to a study on volleyball players aged 14–16 years, which was conducted in 2020 (mean result in boys 15.41 sec and in girls 17.78), the results of the volleyball players in the current study were weaker – the boys' mean result was 19.94 sec and the girls' mean result 20.56 sec [6].

M. R. Esco et al [7] studied young football boys, taking anthropometric measurements (body mass index, body fat percentage and fat-free mass) and three tests (Pacer test, vertical jump and agility T-test). The study revealed that body fat percentage was in statistically significant positive correlation with T-test time (r = 0.61, p < 0.01). In our study, no correlation was noticed in football boys between fat percentage and T-test results. In the study of M. R. Esco et al, the only statistically significant correlation with fat-free mass was the negative correlation with T-test time. Body mass index was not in statistically significant correlation with any test results. In our study, football boys' body mass index did not correlate statistically significantly with any agility test results either.

Considering the body mass index scale, 45 subjects were of normal weight, or their BMI was in the range from 18.5–24.9. Six subjects were overweight, or their BMI was 25–29.9. One subject obese, or her BMI was more than 30, and 11 subjects were underweight with BMI less than 18.5.

A study conducted in Brazil revealed that there were no statistically significant differences in agility tests results between the groups of different sports (volleyball, basketball, indoor football, handball) [8]. The results of our study, however, revealed statistically significant differences – in all agility tests, football players (both boys and girls) were statistically significantly faster than volleyball players and non-athletes.

Our earlier study on 46 volleyball girls, aged 13–16 years showed that the girls' mean body mass index was 20.26 (standard deviation 2.58, minimum 15.90, maximum 28.02). Their mean fat percentage was 18.33% (SD = 3.83%, min 7.49% and max 25.80%) and mean fat amount 7.97 kg (SD = 2.94, min 3.27 and max 16.33) [9]. Our present study showed higher results; volleyball girls' mean body mass index was 23.05 (SD = 3.944), mean fat percentage was 26.62% (SD = 5.166) and mean fat amount was 18.79 kg (SD = 6.332).

E. Zemkova and D. Hamar [10] conducted a study in Slovakia with the participation of 553 young people aged 7–18 years. Their study revealed that test result times decreased with the increase in age until early maturity. The time decreased sharply from 7 to 10 years of age (27.1%) and at the age of 10–14 years (26.5%), or 10-year-olds were faster than 7-year-olds and 14-year-olds faster than 10-year-olds. Thereafter, the time decreased slowly during puberty, at the age of 14–18 years (16.5%). Compared to E. Zemkova and D. Hamar's study results, correlations with age could also be seen in our study. Considering the whole sample, our study yielded similar correlations between age and agility tests results. The best results in Illinois test, 5-0-5 run test, four corners test and T-test were achieved by boys and girls aged 15 and 16 years and the weakest

results by boys and girls aged 13 years. In our study, football boys' and girls' mean age (boys 15.77 and girls 15 years) was higher than the mean of the whole sample (boys 14.91 and girls 14.52 years), and, considering the mean results, they also surpassed the other groups in agility tests.

In his doctoral thesis, L. Raudsepp found a correlation between body mass index and the 10 × 5 run test – larger amount of fat tissue is an obstacle to speed abilities. His earlier studies have shown that fat mass has a negative impact on motor or performance-related physical capabilities [11]. Our study did not reveal any correlation within groups between body mass index and the tests, but in non-athlete boys, we found a correlation between fat indicators and Illinois test results (r = 0.78 – 0.82).

As for height, volleyball girls and football boys were the tallest in the comparison of means. Individually, the tallest were a volleyball boy and a volleyball girl.

Considering the mean results of all agility tests, the best results were achieved by football players, both girls and boys. One of the reasons can be that within the 13–16 age group, most of them were 16 years old, thus the oldest, and had practised for more years. In both boys and girls, non-athletes had the weakest mean results in T-test, four corners test and 5-0-5 run test.

Using Student's t-test to compare boys' agility in different groups, we found statistically significant differences between football and volleyball players, football players and non-athletes, and also between athletes and non-athletes. In one test, a statistically significant difference appeared between volleyball players and non-athletes. In body build characteristics, the only statistically significance difference was between football boys and volleyball boys in height. In other body build characteristics, there were no statistically significant differences between groups in boys. In age, we found statistically significant differences between the groups of football and volleyball players, football players and non-athletes, and athletes and non-athletes.

In girls we found, using Student's t-test, statistically significant differences in all four agility tests between football and volleyball players and football players and non-athletes. In comparison of athletes and non-athletes, we found statistically significant differences in three agility tests. In body build characteristics, we received statistically significant differences in weight, fat percentage, fat amount and body mass index between volleyball players and non-athletes and athletes and non-athletes in mean results of groups. In comparison between football players and non-athletes, there was a statistically significant difference in weight, fat amount and body mass index. In comparison between football and volleyball players, there was a statistically significant difference in weight and fat amount.

Although we selected our sample from the age range of 13–16 years, football boys proved to be the oldest in the entire sample – their mean age was 15.77 years. Most boys were 16 years old, only three were 15. In other groups, there was greater difference in age between the subjects. As the football boys were older, they could have been most successful namely therefore. Thus, we think that their higher age influenced their test results, and therefore, we cannot adequately compare different sports. This might be considered a limitation of the current study.

1. In the comparison between the mean results of athletes and non-athletes, athletes were statistically significantly faster than non-athletes in T-test, 5-0-5 run test and four corners test in both boys and girls. In Illinois test, there was no statistically significant difference in mean results neither in boys nor in girls. Considering body build characteristics, we found statistically significant differences in girls in weight, fat percentage, fat amount and body mass index, but in boys there were no statistically significant differences in body build characteristics. Athlete boys were statistically significantly older than non-athlete boys.

2. In comparison of football and volleyball players, we found statistically significant differences in all the test results in girls. Football girls were more successful. In boys, we found statistically significant differences in favour of football players in T-test, four corners test and Illinois test; only in 5-0-5 run test, there were no statistically significant differences. Both groups surpassed the mean result of the whole sample. Comparison of age, height and weight of football and volleyball players revealed that football boys were statistically significantly older and taller, and volleyball girls were statistically significantly taller and weighed more.

3. In comparison between volleyball girls and non-athlete girls, the weight, fat percentage and fat amount of volleyball players was statistically significantly higher than that of non-athletes. In 5-0-5 run test, there was a statistically significant difference in boys between volleyball players and non-athletes; volleyball boys were faster.

4. In comparison between football players and non-athletes in boys, there were statistically significant differences in favour of football players in T-test, 5-0-5 run test and four corners test. Football boys, however, were also statistically significantly older than non-athlete boys. In girls, statistically significant differences were found in all agility tests – football players were faster than non-athletes. In girls, statistically significant differences were also found in age, weight fat amount and body mass index – in these indicators, football girls surpassed non-athletes.

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