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MOTOR ABILITIES OF 11 – 14 YEAR OLD TENNIS PLAYERS

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Abstract

Introduction: In order to reach the highest level of tennis it is essential to begin trainings in early childhood. In along–term training program of a young competitor, apart from learning techniques and tactics,physical fitness should be also developed. The effectiveness of the game on the court largely dependson motor abilities and the physical fitness of the tennis player.
The aim of the study was an attempt to establish an interrelationships between the rates of motor abilities in general and special characteristics of tennis players aged 10 – 14.
Material and method: The research was carried out on a group of 40 tennis players.For assessment of the level of general efficiency a European test of the physical fitness – Eurofit was used. However, special efficiency was assessed with four tennis tests.
The results of the tests showed systematic development of general and special efficiency at certain rates and a continually significant diversity between training players of particular age groups, especially amongst the youngest tennis players.
Conclusion: 1. Among the examined male and female tennis players, there was a significant variation at the level of general and special efficiency in particular age groups. 2. A statistically significant dependence was found between the results of general and special fitness tests. 3. There is a need to conduct general and special tests in order to program the training process properly for tennis players.

Key words: physical fitness, general fitness, special fitness, effectiveness of training.

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Introduction

Tennis is becoming more and more popular around the world. It is a sportsdiscipline with a global reach.It has beentaken up by more than 72 million tennis players with different levels of advancement in all ages [1]. Tennis is a sport that creates an individual style and gives pleasure from a physical activity as well as joy from every successful hit. It allows tennis players to test their technical, motor and mental possibilities in every game sequence. In order to achieve the highest level of tennis it is necessary to start training in early childhood. In along – term programme of training a young player, apart from learning techniques and tactics, physical fitness should be alsodeveloped. The effectiveness of playing on acourt largely depends to a greatextent on the tennis player's motor skills and physical fitness [2–5].

The reason for this is the preference for a fast, offensive and an aggressive style of play. The tennis player without good physical conditionwould not be able to reach quickly the ball and put himself in the appropriate and convenient position to return. He would notbe able to win.Not so long ago most professional tennis players prepared for tournaments playing only on the court. Now they realise that this is not a sufficient way to master the game, and they base their preparations for tournaments on a well–developed training involving mastering motor ability. On the basis of the theory and practice of sports training, from the aspects of the above skillgeneral and special fitness has been distinguished. Special fitness hasalready been related to a specific sports discipline. It is thought that general fitness is the basis for mastering special fitness, and their mutual proportions are different in particular sports disciplines [6–9].

There are employed specialists like doctors, psychologists, dieticians etc., who work with a playerwho takes up sportprofessionally, and they are responsible for preparing the athletesconsidering techniques, tactics and coordination.Such a complex preparation of a sportsman requires findingmore and more effective methods of training, which improve individual possibilities of the sportsmen under their charge [10–12].

In the process of training tennis players,trainers have a wide range of general and special fitness tests at their di-

sposal. Trainers, guided by their methodological knowledge and experience, look for such sets of tests that reflect the situation of playing on the court. In the meeting tournaments non–cyclical, dynamic movements and frequent changes of running directions are observed. Another characteristic is also the interval effort developing mainly speed endurance, agility and manoeuvrability. The control of the level and dynamics of development of this kind of motor skills should be placed in the general and special fitness tests [13,14].

The problem of the interrelationships between general and special motor effects is still present and requires further scientific research.

The purpose of the study was toattempt to establish relationships between indicators of motor skills which have general and special character of tennis players aged 10–14.

Material and research methods

The research was carried out on a group of 40 tennis players from Student Sport Club „Return" Łomża in July 2018. The participants of the research were divided according to the age categories established bythe Polish Tennis Union and according to gender.

General and fitness tests were carried out on competitors in two age groups: Skrzaty aged 11 – 12 (Group A: 11 male tennis players and 10 female tennis players) and Młodzicy aged 13 – 14 (Group B: 8 male tennis players and 12 female tennis players).

The European Physical Fitness test – EUROFIT was used to assess the overall fitness level. The special fitness of tennis players was tested using tests proposed by A. Królak [14], T. Schefke and J. Zielińskiego [15].

1. Hexagon Agility Test[s]
2. 5 x 8.23 mshuttle run [s]
3. The 6 minute run [laps]
4. Hitting a tennis ball at the distance [m]

The tests indicated statistically significant dependence with the sport result of tennis [16].

The statistical analysis of the results was carried out using descriptive statistics methods which used the schedule of variables characteristics by means of measurements of position, variability and asymmetry and concentration. The results which were obtained from the gathered measurements were presented in the form of tablets, graphs and submitted for statistical analysis using the Student's test and statistical inference was carried out at a standardised level of significance $p<0.05$. The description and interpretation of dependences of variables was determined on the basis of Pearson correlation coefficient.

Results

The analysis of the results of the attempt plate tapping in a group of tennis players aged 12,13,14 showed similar mean value (Table 1). The best mean time was recorded in the group of 12–year–old tennis players. It was 17.18 s. This result was 0.14 better than average time of the trial in the group of 13–year–old players and 0.36 s. better than the average result among 14–year–old players. The weakest time was recorded by an 11–year–old boy 23.10 s.,whereas the best two identical results 15.00 s were recorded in the group of 13 and 14–year – old male tennis players.

Table 1: Distribution of the test results: plate tapping

AGE	SEX	AVERAGE	MINIMUM	MAXIMUM
11	Male	20.55	23.10	16.10
	Female	20.85	24.95	18.10
12	Male	17.18	18.18	16.18
	Female	20.92	27.20	18.11
13	Male	17.32	21.86	15.00
	Female	18.56	16.79	15.00
14	Male	17.54	21.84	15.00
	Female	15.90	16.47	15.00

The analysis of the results of the above trial in a group of female tennis players aged 11–14 showed a significant variation. The best mean result was recorded in the group of 14–year–old female participants and was 15.90 s, and the weakest mean time of performance belonged toan 11–year–old girl and was 20.85 s. In the group of female tennis players aged 13–14 the best result of the trial was recorded which was similar to the group of boys at the same age category and it was 15.00 s. In contrast, the lowest result belonged to a 12–year old female tennis player and was 27.20 s.

Table 2: Distribution of the test results: seated forward bend

AGE	SEX	AVERAGE	MINIMUM	MAXIMUM
11	Male	9.67	6.00	16.00
	Female	7.00	1.00	11.27
12	Male	10.33	6.91	15.31
	Female	6.50	2.80	11.46
13	Male	11.80	3.00	16.00
	Female	12.13	6.00	14.00
14	Male	8.56	3.00	16.00
	Female	6.50	6.00	7.02

In seated forward bend Table. 2, it was noted that the best mean result was achieved by 13–year–old male tennis players 11.80 cm. The group of 14–year old players with the result of 8.56 cm was the weakest one. In three age groups among tennis players aged 11,13,14, the best result of the test recorded was 16.00 cm.,whereas the weakest result of

the test belonged to the 13–year–oldand 14–year–old tennis player and was only 3cm. In the two age groups the biggest difference between the maximum and minimum was noted.

While the analysis of the results of the above trial in the group of female tennis players showed the bestaverage result, similar tothe group of boys it was achieved by 13–year–old female tennis players and was 12.13 cm. At the same time, the result is better than the otherage groups from 5.13 cm to 5.63 cm. The average results obtained in the group of female tennis players aged 11,12,14 were at the similar level 6.50 – 7.00 cm. The best result was achieved by a 13–year–old girl at 14cm and the weakest one at 1cm. was recordedby a female tennis player from the group of tennis players aged 11.

Table 3: Distribution of the tests results: Standing Long Jump Test

AGE	SEX	AVERAGE	MINIMUM	MAXIMUM
11	Male	1.63	1.40	1.80
	Female	1.49	1.20	1.80
12	Male	1.75	1.47	2.00
	Female	1.68	1.49	2.10
13	Male	1.81	1.43	2.00
	Female	1.79	1.60	1.88
14	Male	1.89	1.42	2.40
	Female	1.75	1.60	1.91

The analysis of the tests results Standing Long Jump Test (Table. 3) showed an equivalent improvement in the mean trial value in the particular age groups among boys. The highest mean result was recorded in the group of 14–year–old tennis players. It was 1.89 m, while the lowest mean value 1.63m was obtained by 11–year–old boys. The maximum result of the test was 2.40 m which was achieved by the 14–year–old player,and the weakest one was 1.4 m which was recorded foran11–year–old boy.

In the group of female tennis players the analysis of the results showed that the highest average value of the test was 1.79 m and is for the group of 13–year–old girls,whereas the weakest mean result of the trial was achieved by an 11–year–old female tennis player and was 1.49. The best result of the test was achieved by the 12–year–old female tennis player and was 2.10 m, while the weakest one belonged to an 11–year –old girl and was 1.20 m.

In the trial ofclenching the dynamometer (Table 4), it was noted that in the group of male and female tennis players the increase in the average value of research results rosewith the calendar age. Simultaneously, in the group of boys this increasewasmore significance than in the group of girls.

Among tennis players, the highest mean result was recorded in the group of 14–year–old male tennis players and was 40.00 kg. The lowest average result belongs to a 11–year old tennis competitor,and it was 16.00 kg.In these age groups the best and the weakest result werealso recorded at 60.00 and 9 kg, respectively.

Table 4: Distribution of the test results: clenching the dynamometer

AGE	SEX	AVERAGE	MINIMUM	MAXIMUM
11	Male	16.00	9.00	22.12
	Female	17.57	10.00	25.32
12	Male	21.00	15.34	28.25
	Female	20.50	10.00	27.20
13	Male	30.60	25.41	40.00
	Female	21.69	20.87	27.88
14	Male	40.00	24.67	60.00
	Female	23.75	21.16	27.35

Among female tennis players, the analysis of the test results of the attempts showed that the highest average test value was 23.75 kg for 14–year–old girls,whereas the weakest mean of trial was recorded in a group of female tennis players aged 11 and was 17.57 kg. The best result was achieved by the girl from the group of 12–year–old girls and was 27.20 kg, while the weakest result was recorded by an 11–year–old and 12–year old and was 10 kg.

It is observed that with the calendar age in a group of boys there is a greater difference between the minimum and maximum results of the research. However, in the group of girls, the opposite is true, the difference of minimum and maximum results of attempts decreases with the calendar age.

Table 5: Distribution results of the test results: Flamingo Balance Test

AGE	SEX	AVERAGE	MINIMUM	MAXIMUM
11	Male	22.39	8.00	29.12
	Female	40.92	6.25	60.00
12	Male	37.00	5.35	60.00
	Female	33.32	13.86	47.86
13	Male	47.58	4.00	60.00
	Female	58.75	57.94	60.00
14	Male	27.90	4.00	60.00
	Female	59.50	59.12	60.00

The analysis of the results of the Flamingo Balance Test showed that the highest mean of value was achieved by 13–year–old male tennis players and was 47.58 s (Table 5). In contrast, the weakest mean result was achievedby the group of 11–year–old players and was 22.39 s. In the group of tennis players aged 12,13,14 the highest value recorded was 60.00 s. At the same time, among boys aged 13,14the lowest resultwas achieved and was 4 s.

In the group of female tennis players, the highest average result was obtained by 14–year old female participants and was 59.50 s. Conversely, the weakest average result was

achieved by 13–year–old girls and was 33.32 s. The maximum result belonged to girls from the group of female tennis players aged 11,13,14 and was 60,whilethe minimal one was recordedby an 11–year–old tennis player and was 8 s.

A great difference between minimum and maximum result in every age group particularly in a group of age of male tennis players aged 12,13,14 was observed. Among girls the difference between minimum and maximum resultswasnoticeable only in a group of 11 and 12–year–old female tennis players.

Table 6: Distribution of the test results: seat back from the lying backward position

AGE	SEX	AVERAGE	MINIMUM	MAXIMUM
11	Male	25.00	16.00	39.00
	Female	20.43	14.00	26.00
12	Male	22.33	20.00	24.00
	Female	22.00	18.00	24.00
13	Male	32.60	22.00	37.00
	Female	17.25	16.00	21.00
14	Male	27.22	22.00	37.00
	Female	21.00	20.00	21.00

In theseat back from the lying backward position (Table 6) of a group of male tennis players, the highest mean result was achieved by 13–year–old players and was 32.60 repetitions. The best maximum and the weakest minimum result of the attempt was recorded by 11–year–old male tennis players. They were 39 and 16 bends.

However, among the group of female tennis players , the highest mean result was achievedby 12–year–old tennis players 22.00 repetitions, and the weakest one was achieved by 13–year–old girls and was 17.25. The maximal and minimal results were similar to the result of the group of boys. They were recorded in the group of 11–year–old female tennis players. Their value was 26 and 14 bends.

Table 7: Distribution of the test result: bent arm hang

AGE	SEX	AVERAGE	MINIMUM	MAXIMUM
11	Male	19.18	15.11	24.20
	Female	18.26	4.25	37.28
12	Male	32.57	24.89	44.68
	Female	29.51	20.00	44.70
13	Male	43.41	26.73	53.80
	Female	33.66	25.17	36.83
14	Male	36.90	26.74	49.74
	Female	31.34	25.23	24.19

In the bent arm hang (Table 7), the best average result was recorded by 13–year–old tennis players and was 43.41 s, while the weakest belonged to 11–year–old male tennis players and was 19,18 s.The maximal and minimal values were analogues. The best result was 53.80 s, and it was achieved by a 13–year–old male tennis player, and the weakest one belonged to an 11–year–old male tennis player and was 15.11 s.

The distribution of results among female tennis players is similar. The best group was 13–year old female tennis playerswhosemean result was 33.66 s, and the weakest group was 11–year–old tennis players. Their average result was at the level 18.26 s. The maximum result of the trial was achieved by a 12–year–old female tennis player and was 44.70, and a minimum one was recordedby an 11–year–old female tennis player and was 4.25 s.

Table 8: Distribution of the test results: 10x5m run

AGE	SEX	AVERAGE	MINIMUM	MAXIMUM
11	Male	22.85	21.54	19.48
	Female	24.90	22.15	18.40
12	Male	24.30	22.73	21.73
	Female	22.23	21.64	20.94
13	Male	23.21	20.29	17.20
	Female	21.78	21.07	20.27
14	Male	23.21	20.39	17.36
	Female	21.77	20.97	20.29

In the 10x5m run (Table 8) the best mean time noted was performed by 13–year–old tennis players, and it was 20.29 s, and it is 0.01 better than the 14–year–old tennis players' result. The weakest mean result 22.73 s was achieved by 12–year–old tennis players. Also in this group the weakest result of the test was 24.30 s. In contrast, the best result was recordedby a 13–year–old tennis player who achieved a result of 17.20 s.

The analysis of the results of the test among tennis players showed that with the increase of the calendar age of the girls the mean value of time of performing the trialdecreases. The average value of tennis players within 4 age groups improved by 1.18 s.

Among the 11–year–old female tennis players, there was a large variation between minimum and maximum results. The weakest time was 24.90 s and the best 18.40 s. Among other age groups there wereno such disparities.

In the Hexagon Agility Test (Table 9) the best mean time of the test was achieved by 12–year–old male tennis players, and it was 12.35 s, and this result improved by 0.1 from the average time which was recordedby 13–year–old tennis players. The weakest result in this trial was achieved by 11–year–old players; their time was 15.47 s. In contrast, the best result of the test was achieved by 13 and 14–year–old tennis players, and it was 11,12 s. An 11–year–old boy got the weakest score at 18 s.

Table 9: Distribution of the test: Hexagon Agility Test

AGE	SEX	AVERAGE	MINIMUM	MAXIMUM
11	Male	15.47	18.00	11.37
	Female	14.21	21.07	12.27
12	Male	12.35	13.16	11.63
	Female	14.15	15.83	12.21
13	Male	12.45	13.84	11.12
	Female	11.33	11.47	11.16
14	Male	13.07	15.37	11.12
	Female	11.28	11.41	11.16

Among the group of female tennis players the best average score belonged to 14–year–old girls, and it was only 0.05 s better than the score which was recordedby 13–year–old participants. The maximum and minimum values were analogouswith the boys' scores. The best result 11.16 s was achievedby 13 and 14 –year–old female tennis players, and the weakest one 21.07 s was achieved by an 11–year–old female competitor. Among the group of 11–year–old female tennis players there was a large variation between the minimum and maximum scores. They were 12.35 s and 21.23 s respectively.

Table 10: Distribution of the tests results: 5 x 8.23 m shuttle run

AGE	SEX	AVERAGE	MINIMUM	MAXIMUM
11	Male	13.62	15.22	12.13
	Female	14.35	16.70	12.86
12	Male	1377	14.42	13.11
	Female	13.49	14.31	12.73
13	Male	12.95	14.24	11.92
	Female	13.08	1311	1300
14	Male	12.62	14.23	11.63
	Female	13.07	13.10	13.00

In the 5 x 8.23 m shuttle run the best score was 12.62 s and was achieved by 14–year–old male tennis players (Table 10). In contrast, the weakest mean result was doneby 12–year–old tennis players and was 13,77 s , while the time obtained was 0.15 lower than the result of the 11–year–old players. The maximum and minimum values were similar. The best result which was recorded was 11.63 s and was achieved by 14–year–old male tennis players, and the weakest one was completedby an 11–year–old participant and was 15.22 s.

Among the group of female tennis players, the mean values of the attempt were similar to those of the boys. The best mean result 13.07 s was achieved by 14–year–old female tennis players, and the weakest one was gained by a group of 11 female participants and it was 14.35 s. The maximum result 12.73 was achieved by a 12–year–old female player, and the minimum one was doneby an 11–year–old female tennis player and was 16.07 s. Among the group of 11–year–old female tennis players, the biggest difference between the minimum and maximum resultswas observed.

Table 11: Distribution of the test result: the 6 minute run

AGE	SEX	AVERAGE	MINIMUM	MAXIMUM
11	Male	963.33	886.00	1000.00
	Female	1000.00	968.00	1200.00
12	Male	990.00	969.00	1000.00
	Female	1045.00	800.00	1200.00
13	Male	1298.00	994.00	1500.00
	Female	1100.00	1000.00	1250.00
14	Male	1204.44	993.00	1400.00
	Female	1175.00	1100.00	1250.00

In the 6 minute run (Table 11) the highest mean result was achieved by a group of 13–year–old male tennis players and was 1298.00 m. In contrast, the lowest results were achieved by 11–year–old competitorswhose mean value was 963.33 m. Simultaneously, one can observe similar values of mean results among the group of 11 and 12–year–old players. However, the maximum result was gained by a 13–year–old boy and was 1500 m, and the minimum result was achieved by an 11–year– old male competitor and was 886 m.

Among the group of female tennis players, the average value of the results was proportional to the calendar age of the examined female competitors. The best average result was achieved by the group of 14–year–old girls and was 1175.00 m, and the weakest mean result was achieved by 11–year–old tennis players and was 1000.00 m. In contrast, two 13–and 14–year–old female competitors had the maximum result;the minimum result was achieved by a 12–year–old tennis player and was 800 m.

Table 12: Distribution of test results: hittinga tennis ball at the distance

AGE	SEX	AVERAGE	MINIMUM	MAXIMUM
11	Male	15.00	10.00	21.83
	Female	12.49	8.00	16.00
12	Male	16.23	12.31	18.48
	Female	13.95	8.83	18.94
13	Male	23.10	20.00	26.25
	Female	17.84	15.63	18.25
14	Male	25.61	22.21	27.00
	Female	15.85	15.84	16.00

Hitting a tennis ball at the distance showed a large variety of results among male tennis players. The best result was achieved by 14–year–old tennis players and was 25.61 m , while the weakest average result was achieved by the

group of 11–year–old tennis players and was 15.00 m. The maximum result belonged to the 14–year–old tennis player and was 27 m. The minimum value is only 10 m and was doneby a 11–year–old male tennis player.

Among the female tennis player the best mean result was achieved by 13–year–old competitors and was 17.84 m. and was almost 2 m better than the result of 14–year–old female tennis players. The weakest average result of the test was achieved by 11–year–old girls. The minimum result for them was 8 m.

Correlations between the results of the general fitness–Eurofit and the results of special fitness were examined: Hexagon Agility Test, 5x8.23 m shuttle run, the 6 minute run ,hitting a tennis ball at the distance, for both genders in the examined groups. The results are presented in tables 13 and 14.

Table 13: Pearson correlation coefficient for dependences between the results of the general and special fitness tests among male tennis players in the age group aged 11 and 12– year–old competitors (Group A)

Correlations	Hexagon Agility Test	5 x8.23 mshuttle run	The 6 minute run	hittinga tennis ball
Plate taping	0.9572**	0.5784	-0.5374	-0.5685
Seated forward bend	0.4442	0.2736	-0.6517	-0.8167*
Standing Long Jump Test	-0.3664	-0.5143	-0.4453	0.3150
clenching the dynamometer	-0.4987	-0.5883	0.1147	0.3863
Flamingo Balance Test	-0.0172	0.5285	-0.1986	-0.3637
Seat from the lying backward position	-0.6393	-0.6115	0.5393	0.5873
Bent arm hang	-0.5718	0.1372	0.3075	0.3729
The 10x5m run	0.4536	0.8039*	-0.2172	-0.8312*

* statistically significant dependence p<0.05
** statistically high significance dependence p<0.01
*** statistically very high significance dependence p<0.01

Table 14: Pearson correlation coefficient for dependences between the results of the general and special fitness tests among female tennis players in the age group aged 11–12– year–old competitors (Group A)

Correlations	Hexagon Agility Test	5 x8.23 mshuttle run	The 6 minute run	hitting a tennis ball
Plate taping	0.3856	0.5228	-0.5915	-0.1741
Seated forward bend	-0.5049	-0.3094	0.1715	0.3283
Standing Long Jump Test	-0.3137	-0.7632**	0.6259*	0.6723*
Clenchingthe dynamometer	-0.2245	-0.5871	0.7839**	0.8179**
Flamingo Balance Test	0.2672	-0.0654	0.3605	0,2464
Seat from the lying backward position	-0.4936	-0.5441	0.4583	0.1874
Bent arm hang	-0.1855	-0.8523***	0.8549***	0.8141**
The 10x5m run	-0.2534	0.8052*	-0.3841	-0.4875

* statistically significant dependence p<0.05
** statistically high significance dependence p<0.01
*** statistically very high significance dependence p<0.001

The analysis shows that in a group A among male tennis players there is statistically highsignificance relation between the results of the general fitness test plate taping and the results of special fitness Hexagon Agility Test (almost full correlation). A statistically significant relation was also found between two general efficiency testsseated forward bend and the 10x5mrun versus hitting a tennis ball. The correlation was at the level of 0.81–0.83. At the similar level of 0.80 there was a correlation between the Eurofit the 10x5 m runand thespecial efficiency test 5x8.23 m shuttle run.

Among female tennis players from group A, a very high statistically significant relation was found between the general efficiency test bent arm hangand the special efficiency tests 5x8.23 m shuttle runand the 6 minute run, and the high essential dependence was determined between the indicated tests of general and special fitness test hittingatennis ball at the distance. There was a correlation at the level 0.62–0.76 between the general fitness test Standing Long Jump Test versus three trials of special fitness 5x8.23 m shuttle run, the 6 minute run and the hitting a tennis ball at the distance. There was also statistically significant relation between the Eurofitclenching dynamometertest and special fitness tests the 6 minute run and hittinga tennis ball at the distance. The correlation was 0.78–0.81.

Table 15: Pearson correlation coefficient for relations between the resultsof general fitness tests and the results of special fitness tests among male tennis players in the age group 13–14 (Group B)

Correlations	Hexagon Agility Test	5 x8.23shuttle run	The 6 minute run	Hittinga tennis ball
Plate taping	0.5720	0.9004*	-0.6370	0.1141
Seated forward bend	0.2641	0.9250**	-0.2484	-0.5594
Standing Long Jump Test	0.1018	-0.8337*	0.6141	0.1744
clenching the dynamometer	-0.2524	-0.5854	-0.2256	0.5457
Flamingo Balance Test	-0.3529	-0.1546	0.6086	-0.7290
Seat from the lying backward position	-0.5928	-0.2982	0.6841	-0.5276
Bent arm hang	-0.4541	-0.5540	0.8770*	-0.4821
The 10x5m run	0.6272	0.8841*	-0.5155	-0.1526

* statistically significant dependence p<0.05
** statistically high significance dependence p<0.01
*** statistically very high significance dependence p<0.001

Table 16: Pearson correlation coefficient for relations between the results of general fitness tests and the results of special fitness tests among female tennis players in the age group 13–14 (Group B)

Correlations	Hexagon Agility Test	5 x8.23 mshuttle run	The 6 minute run	Hitting a tennis ball
Plate taping	-0.1836	0.4928	-0.1250	0.6557
Seated forward bend	0.0982	0.2291	-0.3992	0.9997*
Standing Long Jump Test	-0.5185	0.9974*	0.6564	0.2847
clenching the dynamometer	-0.6531	0.6040	0.8561*	-0.4148
Flamingo Balance Test	0.3027	-0.5931	-0.1973	-0.7438
Seat from the lying backward position	-0.2141	-0.1135	0.5001	-0.6951
Bent arm hang	-0.2148	-0.1344	0.5030	-0.6950
The 10x5m run	-0.7473	1.0000***	0.6027	0.2084

* statistically significant dependence p<0.05
** statistically high significance dependence p<0.01
*** statistically very high significance dependence p<0.001

From the analysis which was carried out among male tennis players in group B (Table 15) claimed that there is a high statistically significant relation between the results of the Eurofitplate tappingtest, seated forward bend, Standing Long Jump Test and the 10x5m runversusthe attempt ofspecial fitness 5x8.23 m shuttle run. The correlation remainedat the level 0.83–0.92.

A significant relationship was also recorded between the results of the overall fitness test bent arm hand and the special fitness test the 6minute run. The correlation was 0.87.

Among female tennis players from group B (Table 16) there was a very high statistically significant relationship between the results of the general fitness test 10x5m run and the results of the special fitness test 5x8.23m shuttle run and between the results of the attempt seated forward bendand the results of the special fitness test of hittinga tennis ball at the distance. The correlation was almost full. It was also found that there was a correlation between the general efficiency test Standing Long Jump Test and the special efficiency test 5 x 8.23 m shuttle run and the general fitness clenching the dynamometertest and the 6 minute run. The correlation remainedat the level 0.85–0.99.

Discussion

Movement is a fundamental aspect of a human activity, in which the whole diversity of one'spersonality, health, physical and mental condition is identified. The development of motor skills depends on many intermingling factors that originate from two basic sources: genetic and environmental background [4, 7, 8, 17–20].

The long–term process of sport training requires a constant flow of information on the biological development of practicing sport, their physical fitness, the size of training loads, as well as the body's reaction to special physical effort during training and sports competitions [10,18,19]. This work investigatedthe issue of mutual relationship between versatile (general) physical and special fitness (tennis), two basic forms of aspect of human motility, which areconsiderablefor adolescents who take up sport. Królak (1997) Ziemann, Garsztka (2010) draw attention to the need to conduct general and special fitness testsbecause they provide important information about the competitor's progress, make the training classes more appealingand also illustrate the student's attitude in the situation of sport competitionfor the trainer andthe playerat early stages of training.The research presented above confirms the opinion of eminent specialists in the field of sport training theory that information about the level and development of general and special fitness from the beginning of the training process serves not only to optimise the training, taking into account individual predisposition and acquired motor skills, but it allows trainers to anticipate particular stages of training and effects of a sports career [10, 12, 16].

Compering the results of general fitness test of 11 and 14 year old female and male tennis players from Łomża with the results of Osiński, Biernacki's (1993) research, a significant variation of results in particular tests which have beenachieved by Student Sport Club „Retur""Łomża competitors versus children and adolescents from Poznań can be noticed [21].

In the plate tapping test and the seated forward bend, the average results achieved by male and female tennis players from Łomża in a particular age group were at a low level. On the other hand, in the attempt Standing Long

Jump Test and bent arm hang the average result according to the standards elaborated by Osiński W., Biernacki J. are above average and at a high level. Another test in which one can assess the level of the examined male and female tennis players is clenching the dynamometer. The 14–year–old tennis players performed very well in this test, with an average score of 40 kg, which gives a level above the average result, while 13–year–old tennis players with a result of 30.6 kg achieved anaverage level. In contrast, 11and 12–year–old male tennis players and female tennis players in all four age groups were at a low level. In the general fitness seat from the lying backward position, 13 and 14 –year–old tennis players achieved a high level, while 11 and 12–year–old players gained an above–average level. The girls in the group of 11 and 13–year–old achieved a low result, but 12 and 14–year–old tennis players achieved a result below the average level.The last attempt was assessed, analyse and compare the level of development of female and male tennis players Student Sport Club „Return" Łomża with adolescents from Poznań is the 10x5m run. In this trial the results at all age female and male groups oscillate below the average level.

Compering the results of research of special fitness with the results of the research done by A. Królak (1997), who developed percentage rating and a point scale from 1 to 10, one can notice a large variation of results achieved by tennis players from Łomża in particular tests.In the attempt Hexagon Agility Test13 and 14–year–old female tennis players presented their skills best achieving 70%.However, 11–year–old boys achievedonly 10%. An average result 50% was recorded by 13–year–old tennis players. The rest of age groups, referring to table A. Królak gained 20%–30%. Another trial in which one can compare and assess the level of special fitness test of male and female tennis players Student Sport Club „Return" Łomża is the 5x8.23m shuttle run. In this test the competitors in particular age category achieved the result, which according to the table A. Królak, gives them from 2–4 points out of a possible 10.

The correlation analysis showed that in the group of 11–12 female tennis players general fitness tests: Standing Long jumpand bent arm hangcorrelate with three special efficiency tests, i.e. the 5x8.23m run shuttle, the 6minute run and hittinga tennis ball. In contrast, the highest level of dependence was observed between the general fitness test: plate tapping and eth Hexagon Agility Test. The correlation was at the level of 0.95.

In the group of 13–14 male and female tennis players, the special efficiency test 5x8.23m shuttle run correlated with four trials of general efficiency. The plate tapping test in the group of girls the correlation was 0.90, while theseated forward bend in the group of boys the correlation was 0.92. The statistically significant dependence at the level of 0.83–0.99 was also recorded in the attempt Standing Long Jump Test in the group of male and female tennis players. The highest level of dependence was recorded both in the group of boys and girls taking up tennis between the 10x5m and the 5x8.23m shuttle run. The correlation was at the level 0.88–1.

The results of research showed systematic development of particular rates of general and special fitness,as well as persistently large differences between players in particular age groups, especially among the youngest tennis players. There are also substantial divergencesin the test results between competitors Student Sport Club „Return" Łomża and the examined players in the work of other authors as well as changes for improving and deteriorating of players' skillswhich determine the level of general motorfitness of a human.

Conclusions

1. Among the examined male and female tennis players, there was a significant variation at the level of general and special efficiency in particular aged groups.
2. The results of research showed a systematic development of general and special fitness of examined male and female tennis players.
3. A statistically significant dependence was found between the results of general and special fitness tests.
4. There is a need to conduct general and special tests in order to planthe training process properly for tennis players.

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