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Somatic Characteristics and Motor Capacity of 10-Year Swimming Pools from Basic School No. 60 in Bydgoszcz

Mirosława Szark-Eckardt[1], Marek Napierała[1], Jerzy Eksterowicz[1], Walery Zukow[2], Robert Łukaszewski[1]

[1] Department of Physical Education, Health and Tourism, Kazimierz Wielki University, Bydgoszcz, Poland
[2] Faculty of Earth Sciences,Nicolaus Copernicus University Nicolaus Copernicus University, Torun, Poland

ABSTRACT

The aim of the study was to determine the state of somatic traits and motor abilities of ten-year-old pupils from Primary School No. 60 in Bydgoszcz. Two groups of children were tested – swimming and non-swimmers. There were five attempts from the International Physical Fitness Test to assess motor skills such as strength, agility, speed, abdominal strength, flexibility. Body height, body weight, BMI, Rohrer parameters were used to evaluate somatic features. The total number of students was 54 students, 34 boys, 20 girls. Each of the students performed five fitness tests. The research hypothesis is that children who practice swimming will show better physical fitness than children who do not practice swimming and that the two groups will not differ in terms of somatic traits.

Key words: *somatic features, motor skills, swimming, sports classes,*

Introduction

Swimming is one of commoner sports disciplines. Not only children, but also every man can plant it from the baby (up to the presence of the parents), through children, young people, adults, finishing on persons in the advanced century. Swimming has the beneficial impact on our condition, function, and at the same time through displacement doesn't cause water of burdens for ponds. It is recommended at many diseases and illnesses, also at unfolding abnormal spinal curvatures at children.

Beginning the school learning up to the moment of ripening, we can additionally divide in subperiods. First, it is a moment, when the child goes to the school. It's a well-known fact that it is difficult adaptive time for the young man, peculiar, if not he attended the nursery school in the previous period or is burdened with defects, with weaknesses. School, regulating the life of children, requiring new behaviors and continuing them at home, remembering, reducing the freedom of movement, separation with the mother, family, large cluster of children, noise, can have a hindering impact on the development of the child.

The other subperiod, it's time, when the child acclimatized in terms of physics and mentally to school conditions and his development achieves the children's excellence[1].

A school period is a change of the current habits of the child. Through the imposed school duty and the need for calm sitting in the duration of the lesson, not perhaps it already freely to choose periods of the physical activity for oneself. For the neurological system, in which still processes of stimulating above braking prevail, it is a difficult adaptive task. During this period, it is not only important, so that the teacher plans breaks for children, assuming motor exercises, but also controlled the conduct of the sitting child. Neglecting this activity can lead the malformation of the attitude for developing bad habits, and consequently[1].

Swimming is a wonderful locomotion for every man, irrespective of the age, of sex, and with times of avian diseases, defects or illnesses. At the swimming pool, whether we will come across the swimming pool baby, preschool children, school, young people, adults, elderly people, children with abnormal spinal curvatures, of people overweight and with obesity. Why is swimming for everyone? An influence of water on the body of the man is a meaning element. If in ancient times an Archimedes already discovered, the weight of the immersed body in the water reduces [2]. An intense influence on the versatility of practice sport swimming is which has it. Through the reduced weight of the body, the man gains the accretion of

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the motor activity of the body. We must not »to carry« of the weight of our body, thanks to that, hip, jumping knee joints, ponds of the spine they are lightened, and consequently it is easier for us to move. A smaller fatigability of the organism is a consequence of these profits of swimming, of particularly articular areas, greater safety of the exercises, and thanks to that faster effect of the dieting, increased range of the chattel in ponds and better circulatory-respiratory function[3].

Summing up, the value of recreational swimming is worth its weight in gold for improving the physical fitness. However, differing requirements and a development long for the physical fitness in case of professional planting this sport. The swimmer future, being successes should have certain somatic features, so as height, slender, appropriate span of shoulders (measured from the finger to the finger by stretching hands), the size and the length of the hands which not only increase the surface of the pool, but they also reduce the frequency of movements and increase the productivity of hands in the water. It alone is taken back to the size of the feet[3].

The motor development of the swimmer has started being significant already pre-school and early-school. Children in this century quickly learn the discipline, the technique, the sequence and the synchronization of movements in determining styles. A respiratory function and an endurance are a very important aspect of swimming already on the cellular level. Doctor Rushall Thoughts very much curiously describes the significance of improving the physical fitness on the cellular level. Its most detailed comparing the physical fitness to the secretion of the lactic acid is an interesting aspect. When conditioning programs are tested, physical abilities are stimulated in different amounts. The type of conditioning will affect the level of every achieved ability. In swimming it usually has huge benefits to increasing physical fitnesses to the maximum level in the determined order[4].

If appropriate steps and intensity aren't recommended for the work for individual persons, some swimmers can work, too little, and another to overwork. Determining optimum training actions which include an appropriate blend is setting the coach endurances aerobic, powers aerobic, of tolerance for the lactate and abilities of the sprint. Every of these forms requires different intensities, the duration of repeating and breaks of the rest. For everyone he will differ, depending on developing better or worse the motor activity in giving fields. At the appropriately selected training, exercising should to a maximum develop his abilities and the physical fitness[4].

Aims and research hypotheses

The main objective of the study is to compare the physical fitness 10-years old of swimmers is a main aim of examinations from the Primary School No. 60 in Bydgoszcz practicing swimming – hereinafter referred to in contents with examining group, and not taking this fitness – named hereinafter of work with the control group. Examinations should show, which group by examining children is characterized by better motor abilities and a somatic development.

1. Establishing parameters of the height and body weights of pupils,

   Comparing results of swimmers to the control group,

   Setting the BMI rate and slendernesses of the body of pupils of both groups,

2. Determining the ability of motor pupils,

   Comparing group results examined to the control group of groups, including the dimorphism examined.

We put hypotheses being based on assuming the plausibility which exists in kind. Based on the certain general knowledge, we try to prove that our assumptions are real.

In the work a hypothesis were constructed, that somatic characteristics of boys and girls from both groups don't differ from themselves, and swimmers demonstrate the better general fitness than boys and girls not practicing swimming.

Material and methods

In the examination, it was overcome 54 children attending to the Primary School No. 60 in Bydgoszcz altogether the participation. Examined they divided in two groups. There were 27 pupils in the group of swimmers (50.0%) of sports classes and there were 27 pupils in the control group (50.0%) inspiring classes, persons attending exclusively classes of the physical education in frames of the motor activity (table 1).

Somatic features were determined based on the height and the body weight. Height of the body examined were measured anthropometr with the accuracy up to 1 cm. Examined was placed in standing position, straightened, natural for examined of position, upper limbs placed along the torso. Joined lower limbs with heels, head placed in the coronal plane, of fibular axis.

The body weight was measured on the medical scale with the accuracy up to 100 HR They were examined weighed in the sportswear, on barefooted. The examination took place in the morning, before sports classes, each of pupils ate one meal.

TABLE 1.
DIVISION EXAMINED ON ACCOUNT OF THE SEX

Sex	Swimming group		Control group		With time	
	n	%	n	%	n	%
Girls	10	37.0%	10	37.0%	20	37.0%
Boys	17	63.0%	17	63.0%	34	63.0%
Total	27	100.0%	27	100.0%	54	100.0%

TABLE 2
HEIGHT OF THE BODY

Height of the body [cm]		Descriptive statistics						
		n	$\bar{x}$	My	Min.	Max.	SD	p
Girls	Swimmers	10	142.15	140.25	137.00	150.00	4.22	t = –0.30 p = 0.770
	Control	10	142.95	144.00	133.50	153.50	7.41	D = 0.08 WD = 0.02
Boys	Swimmers	17	143.88	143.50	131.50	157.50	7.67	t = 0.63 p = 0.534
	Control	17	142.29	141.50	130.00	153.00	7.05	D = 1.59 WD = 0.21

n – number of observations; $\bar{x}$ – arithmetic mean; Me – median; Min – minimum; Max – maximum; Q1 – bottom quartile; Q3 – upper quartile; SD – standard deviation; WD – Mollison indicator
t – result of t – Student test for an operands; p – level probabilities
Source: own study – regarding all tables

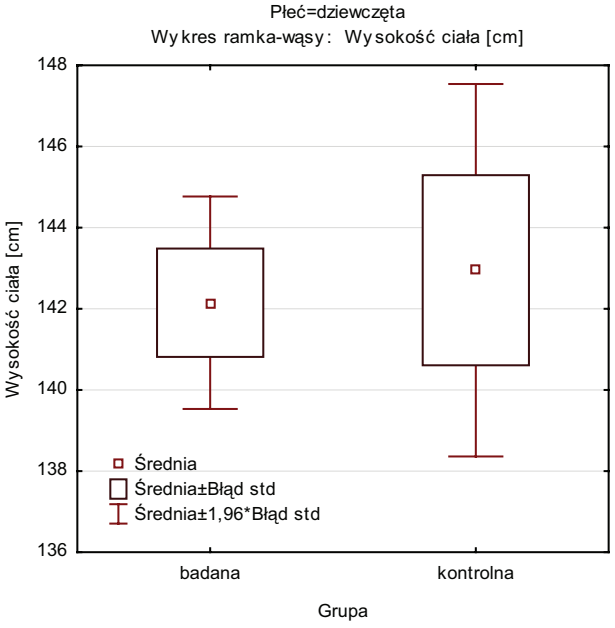

Fig. 1. Height of the body of girls from the examined and test group Source: own study – regarding remaining drawings.

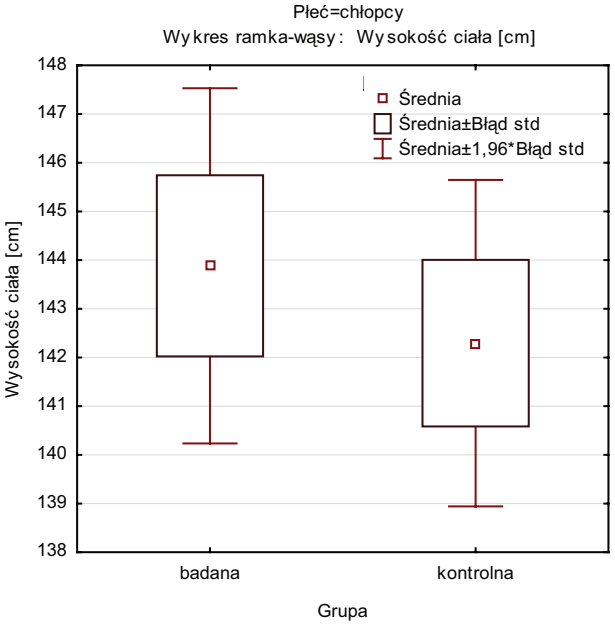

Fig. 2. Height of the body of boys from the examined and test group.

Examinations were commenced from establishing somatic features by weighing and measuring pupils by the nurse in a doctor's surgery in order to set the BMI rate for everyone of the pupil. For getting accurate results pupils of clothes were into the sportswear (shorts and the T-shirt) for the duration of the examination had a footwear taken off.

The BMI indicator, i.e. the weight-growth indicator being used to determine the body weight of the body falling on 1 cm to the height. Achieved results were compared with norms drafted by Barbara Woynarowska[5].

They also effected classification of types of the build of all examined pupils according to the typology E. Kretschmer and using the key E. Curtis[6]:

Five trials with the purpose of assessing of motor abilities used for the International Test of the physical fitness. Applied attempts it: the long jump, pendular run, runs to 50 meters, the endurance of the belly muscles, suppleness[7].

Pupils were instructed about the way of performing attempts, everyone had the sportswear on.

Obtained findings own both of somatic as well as motor features they were subjected to a statistical analysis and a control group was compared with the examined group and for other calculations they used providing the developed package software to the statistical Statistica 12 data analysis. With the help of this tool they calculated and they presented graphically:

TABLE 3.
BODY WEIGHT

Body weight [kg]		Descriptive statistics						
		n	$\bar{x}$	My	Min.	Max.	SD	p
Girls	Swimmers	10	36.98	36.80	26.20	50.70	7.69	t = 0.14 p = 0.887
	Control	10	36.52	35.85	27.60	47.60	6.48	D = 0.46 WD = 0.06
Boys	Swimmers	17	38.96	37.20	26.50	57.00	8.87	t = 1.28 p = 0.210
	Control	17	35.36	34.70	23.90	49.50	7.47	D = 3.60 WD = 0.41

N – number of observations; $\bar{x}$ – arithmetic mean; Me – median; Min-minimum; Max-maximum; Q1 – bottom quartile; Q3 – upper quartile; SD – standard deviation; WD – Mollison indicator
t – result of t – Student test for an operands; p – level probabilities
Source: own study

- T-Student test for an operand for groups < 30 – t
- Level of the probability – p
- A coefficient of correlation was calculated – r, intrinsic values statistically they presented graphically
- A participation was demonstrated or for her a gravity lacks statistical differences between results

This program gives a wide selection of analysis procedures and the data management, provides also a visualization of analysis results and generating reports.

Analysis of findings

A lack of substantial presences was demonstrated statistically of differences between the height of the body of girls from the group examined and test (p = 0.770) and of boys from the examined and test group (p = 0.534). The average height of the body of girls from the examined group was 142.15 cm ± 4.22 cm, the average height of the body of girls from the control group was 142.95 cm ± 7.41 cm, the average height of the body of boys from the examined group 143.88 cm ± 7.67 cm and the average height of the body of boys from the control group 142.29 cm ± 7.05 cm (table.2., figures 1, 2).

A lack of substantial presences was demonstrated statistically of differences between the body weight of girls from the group examined and test (p = 0.887) and of boys from the examined and test group (p = 0.210). The average body weight of girls from the examined group was 36.98 kg ± 7.69 kg, average body weight of girls from the control group was 36.52 kg ± 6.48 kg, average body weight of boys

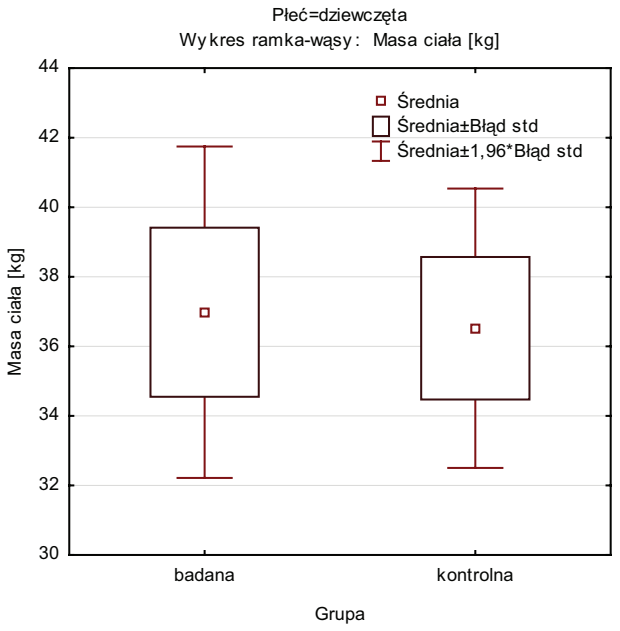

Fig. 3. Body weight of girls from the examined and test group.

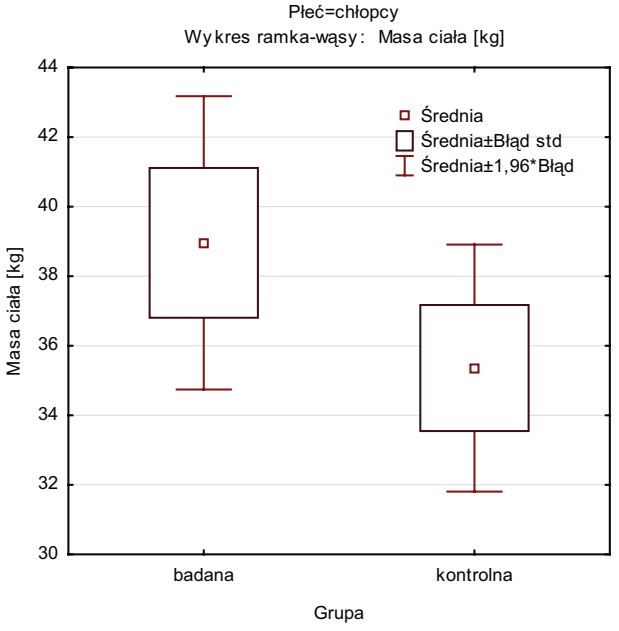

Fig. 4. Body weight of boys from the examined and test group.

TABLE 4
BMI

BMI [kg/m 2]		Descriptive statistics						
		n	$\bar{x}$	My	Min.	Max.	SD	p
Girls	Swimmers	10	18.23	17.42	13.96	23.62	3.34	t = 0.32 p = 0.751
	Control	10	17.81	16.94	15.37	21.73	2.39	D = 0.42 WD = 0.13
Boys	Swimmers	17	18.61	17.51	13.92	23.60	2.69	t = 1.42 p = 0.165
	Control	17	17.33	17.29	12.19	21.71	2.60	D = 1.28 WD = 0.48

n – number of observations; $\bar{x}$ – arithmetic mean; Me – median; Min-minimum; Max-maximum; Q1 – bottom quartile; Q3 – upper quartile; SD – standard deviation; WD – Mollison indicator
t – result of t – Student test for an operands; p – level probabilities
Source: own study

from the examined group 38.96 kg ± 8.87 kg and the average body weight of boys from the control group 35.36 kg ± 7.47 kg (table 3., figures 3, 4).

A lack of substantial presences was demonstrated statistically of differences between BMI of girls from the group examined and test (p = 0.751) and of boys from the examined and test group (p = 0.165). BMI averages of girls from the examined group gained 18.23 kg/m2 ± 3.34 kg/m2, BMI averages of girls from the control group was 17.81 kg/m2 ± 2.39 kg/m2, BMI averages of boys from the group examined 18.61 kg/m2 ± 2.69 kg/m2 and BMI averages of boys from the control group 17.33 kg/m2 ± 2.6 kg/m2 (tbl. 4., fig. 5, 6).

A lack of substantial presences was demonstrated statistically of differences between the size of the indicator of Rohrer of girls from the group examined and test (p = 0.717) and of boys from the examined and test group (p = 0.187). The average Rohrer indicator of girls from the examined group amounted to 1.28 ± 0.23, the average Rohrer indicator of girls from the control group amounted to 1.25 ± 0.17, average indicator of Rohrer of boys from the group examined 1.29 ± 0.16 and average Rohrer indicator of boys from the control group 1.22 ± 0.17 (tbl. 5., fig. 7, 8).

Statistically important differences were shown in the examination with Mollison indicator. Both boys and girls from the swimming group have positive values of the Mollison rate both from a features anthropometric (including BMI and the Rohrer indicator) as well as of the results of the measurement of efficiency tests. At boys from the group examined run on 50, the pendular run and the at-

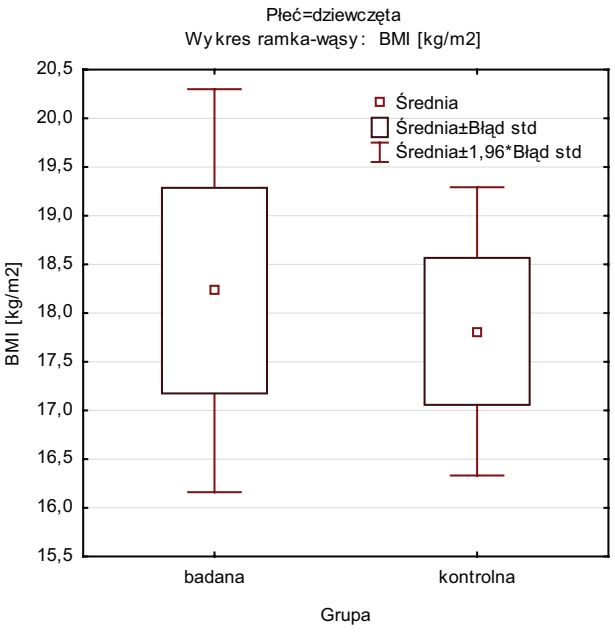

Fig. 5. BMI of girls from the group examined and test.

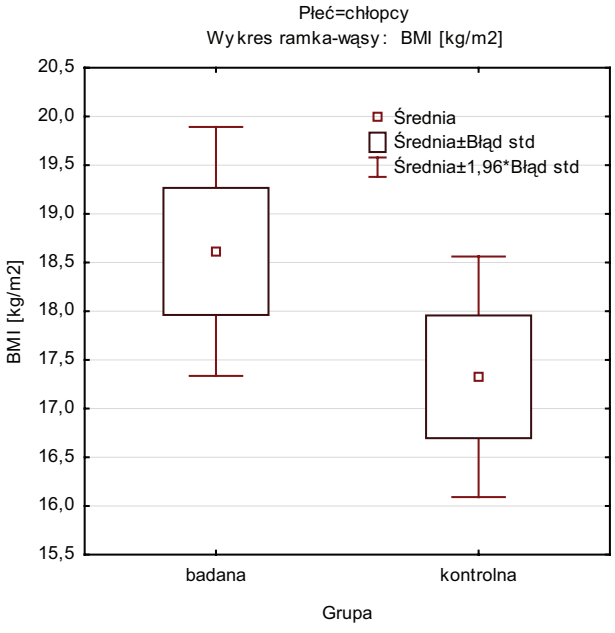

Fig. 6. BMI of boys from the group examined and test.

TABLE 5
ROHRER INDICATOR

Rohrer indicator		Descriptive statistics						
		n	$\bar{x}$	My	Min.	Max.	SD	P
Girls	Swimmers	10	1.28	1.22	1.02	1.62	0.23	t = 0.37 p = 0.717
	Control	10	1.25	1.21	1.03	1.49	0.17	D = 0.03 WD = 0.13
Boys	Swimmers	17	1.29	1.26	1.01	1.56	0.16	t = 1.35 p = 0.187
	Control	17	1.22	1.21	0.87	1.51	0.17	D = 0.07 WD = 0.43

n – number of observations; $\bar{x}$ – arithmetic mean; Me – median; Min-minimum; Max-maximum; Q1 – bottom quartile; Q3 – upper quartile; SD – standard deviation; WD – Mollison indicator
t – result of t – Student test for an operands; p – level probabilities
Source: own study

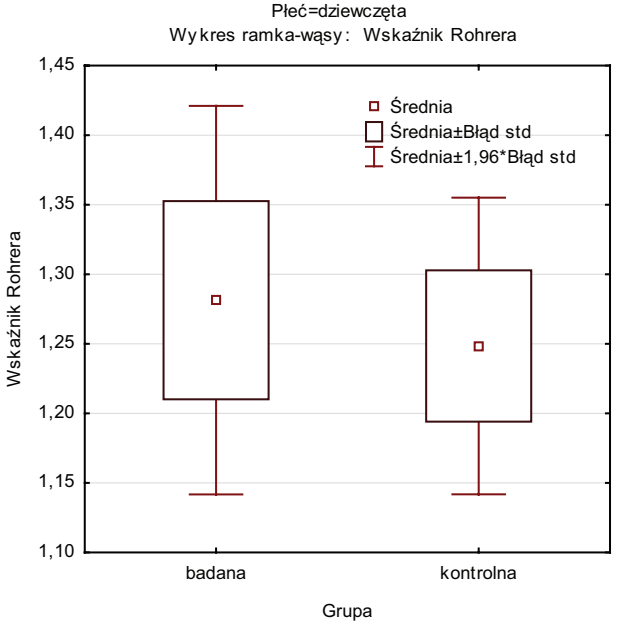

Fig. 7. Indicator of Rohrer of girls from the group examined and test.

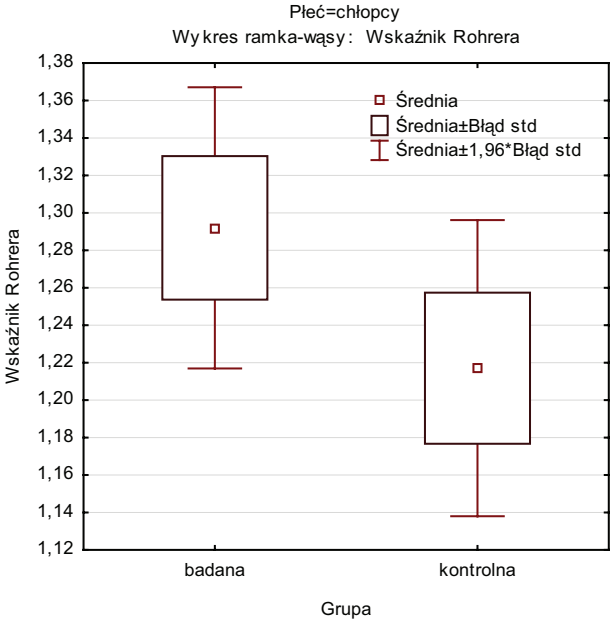

Fig. 8. Indicator of Rohrer of boys from the group examined and test.

tempt of the suppleness have values definitely biggest, whereas least running away from the control group these are features of the somatic structure. At girls in the swimming group results develop very similarly, although differences in the somatic structure towards the control group are much smaller, at simultaneous even bigger diversifying than in boys of results of tests of the efficiency (in all attempts). Benefitting from comparing the results of the Mollison rate from one graph of the examined group of boys and girls it is possible to compare developing divergences depending on the sex. Girls from the group examined in spite of smaller under construction disproportions somatic (towards the control group) have considerable more diversified results of tests of the efficiency. However boys from the examined group having more heterogeneous results of measurements anthropic (with regard to the

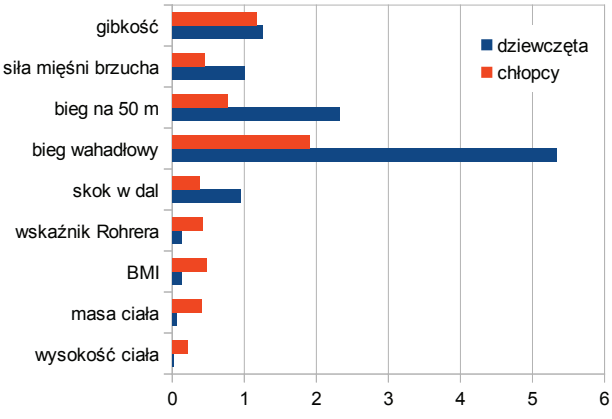

Fig. 9. Mollison indicator.

TABLE 6
THE LONG JUMP FROM THE PLACE

The long jump from the place [cm]		Descriptive statistics						
		n	$\bar{x}$	My	Min.	Max.	SD	p
Girls	Swimmers	10	138.00	137.50	120.00	165.00	13.17	t = 1.55 p = 0.138
	Control	10	125.50	122.50	80.00	150.00	21.79	D = 12.5 WD = 0.95
Boys	Swimmers	17	147.06	150.00	110.00	175.00	21.65	t = 1.07 p = 0.294
	Control	17	138.82	145.00	100.00	170.00	23.35	D = 8.24 WD = 0.38

n – number of observations; $\bar{x}$ – arithmetic mean; Me – median; Min-minimum; Max-maximum; Q1 – bottom quartile; Q3 – upper quartile; SD – standard deviation; WD – Mollison indicator
t – result of t – Student test for an operands; p – level probabilities
Source: own study

TABLE 7
TESTS OF THE GRAVITY FOR THE LONG JUMP FROM THE PLACE IN CASE OF OTHER COMBINATIONS AMONG GROUPS AND THE SEX

Steam from variables	t	P
Girls of the swimmer – boys swimmers	–1.19	0.243
Test girls – test boys	–1.46	0.155

t – result of t – Student test for an operands; p – level probabilities

control group) demonstrate diversifying smaller than the girls' results of tests of the efficiency – towards boys from the control group. (fig. 9.).

A lack of substantial presences was demonstrated statistically of differences between the result achieved in the attempt of the long jump right away by the girls from the examined andtest group (p = 0.138) and from the group examined by boys and test (p = 0.294). The average result of girls from the examined group was 138 ± cm, 13.17 cm, average result of girls from the control group was 125.5 cm ±, 21.79 cm, average result of boys from the examined group 147.06 cm ± 21.65 cm and the average result of boys from the control group 138.82 cm ± 23.35 cm (tbl. 6., 7, fig. 10., 11).

A participation was demonstrated essential statistically of differences between the result achieved in the test on the pendular gear by girls from the examined and test group (p < 0.001) and from the group examined by boys

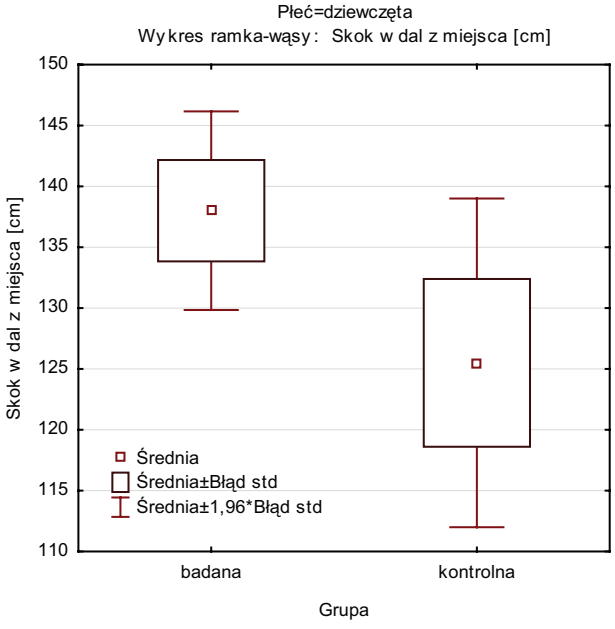

Fig. 10. The long jump right away amongst girls from the group examined and test.

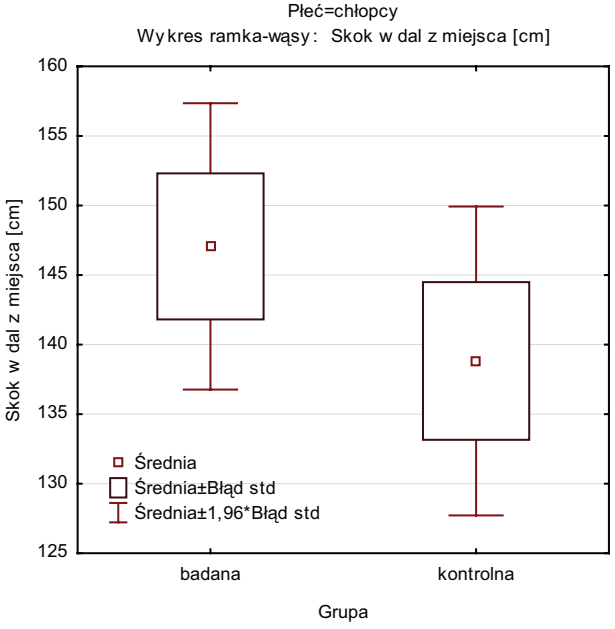

Fig. 11. The long jump right away amongst boys from the group examined and test.

TABLE 8
PENDULAR RUN 4 X OF 10 M

Pendular run 4 x of 10 m [sec.]		Descriptive statistics						
		n	$\bar{x}$	My	Min.	Max.	SD	P
Girls	Swimmers	10	12.03	12.10	11.51	12.50	0.35	t = -5.55 p < 0.001
	Control	10	13.90	14.08	12.36	15.48	1.01	D = 1.87 WD = 5.34
Boys	Swimmers	17	11.40	10.95	10.41	13.00	0.85	t = -5.49 p < 0.001
	Control	17	13.02	12.77	11.85	14.84	0.86	D = 1.62 WD = 1.91

n – number of observations; $\bar{x}$ – arithmetic mean; Me – median; Min-minimum; Max-maximum; Q1 – bottom quartile; Q3 – upper quartile; SD – standard deviation; WD – Mollison indicator
t – result of t – Student test for an operands; p – level probabilities
Source: own study

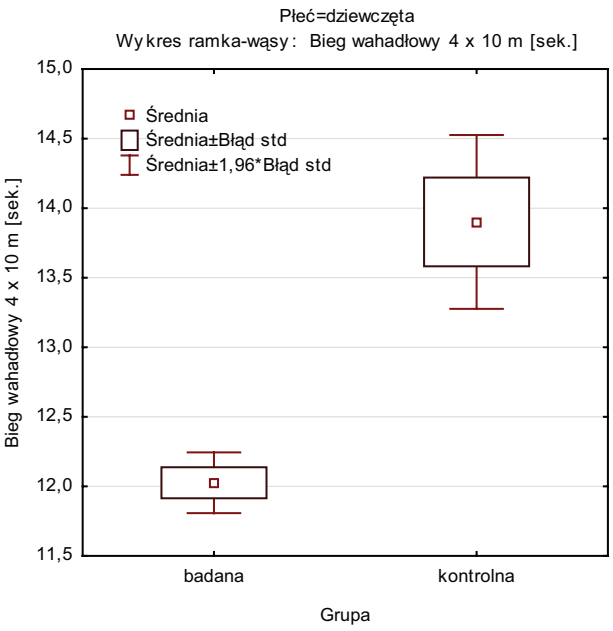

Fig. 12. Pendular run amongst girls from the group examined and test.

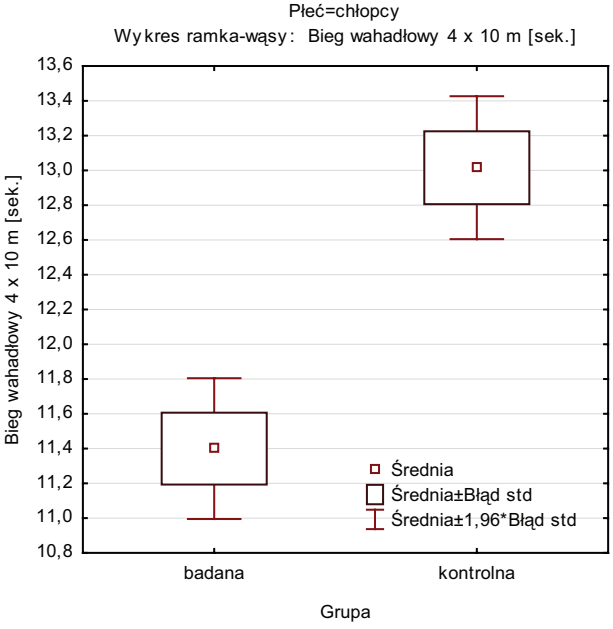

Fig. 13. Pendular run amongst boys from the group examined and test.

and test (p < 0.001). The average result of the measurement of the time in case of girls from the examined group amounted to 12.03 sec. ± 0.35 sec., whereas the average result of the measurement in case of girls from the control group was higher and amounted to 13.9 sec. ± 1.01 sec. The average result of the measurement of the time in case of boys from the examined group amounted to 11.4 sec. ± 0.85 sec., whereas the average result of the measurement in case of boys from the control group was higher and amounted to 13.02 sec. ± 0.86 sec. (tbl. 8., fig. 12 and 13).

Moreover a participation was demonstrated essential statistically relations between results achieved in the test on the pendular gear by girls and boys from the swimming group (p = 0.037), where boys achieved good results, by girls and boys from the control group (p = 0.023), where boys achieved good results. (tbl. 9.).

A participation was demonstrated essential statistically of differences between the result achieved in the test on the gear on 50 m by girls from the examined and test

TABLE 9
TESTS OF THE GRAVITY FOR THE PENDULAR RUN IN CASE OF OTHER COMBINATIONS AMONG GROUPS AND THE sex

Steam of variables	t	P
Girls of the swimmer – boys swimmers	2.20	0.037
Test girls – test boys	2.41	0.023

t – result of t – Student test for an operands; p – level probabilities

TABLE 10
RUN ON 50 M

Run on 50 m [sec.]		Descriptive statistics						
		n	$\bar{x}$	My	Min.	Max.	SD	p
Girls	Swimmers	10	10.39	10.14	9.20	11.56	0.84	t = -3.68 p = 0.002
	Control	10	12.35	12.66	10.01	14.79	1.46	D = 1.96
								WD = 2.33
Boys	Swimmers	17	9.97	9.54	8.25	12.60	1.37	t = -2.41 p = 0.022
	Control	17	11.03	10.88	9.14	13.60	1.19	D = 1.06
								WD = 0.77

n – number of observations; $\bar{x}$ – arithmetic mean; Me – median; Min-minimum; Max-maximum; Q1 – bottom quartile; Q3 – upper quartile; SD – standard deviation; WD – Mollison indicator
t – result of t – Student test for an operands; p – level probabilities
Source: own study

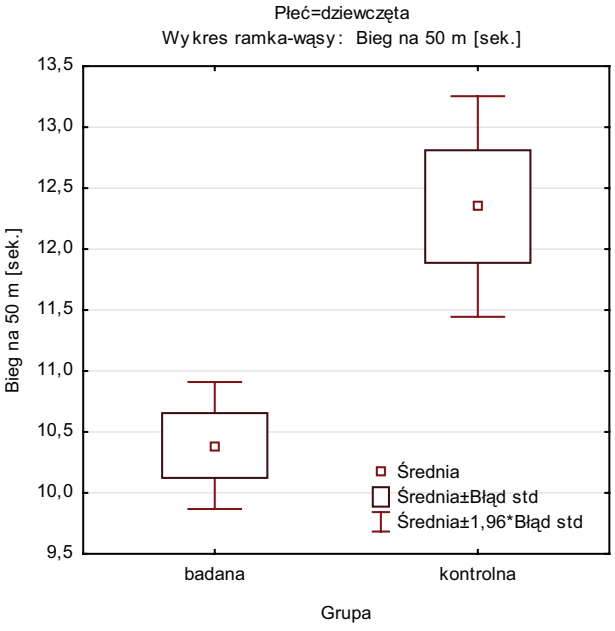

Fig. 14. Run on 50 m amongst girls from the group examined and test.

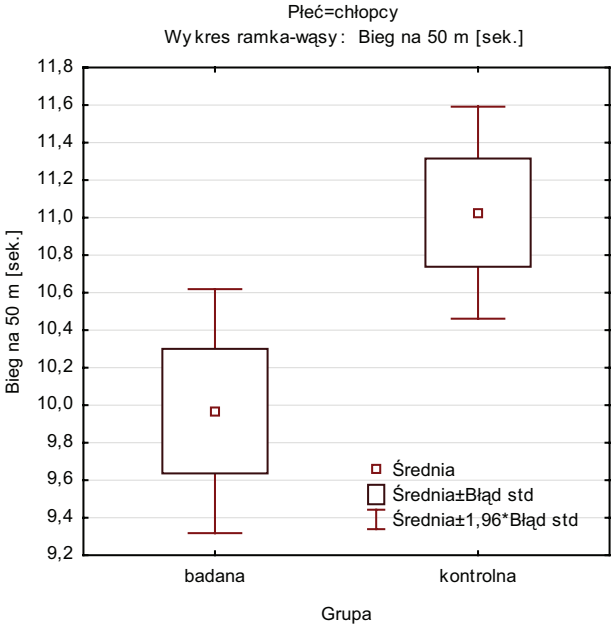

Fig. 15. Run on 50 m amongst boys from the group examined and test.

group (p = 0.002) and from the group examined by boys and test (p = 0.022). The average result of the measurement of the time in case of girls from the examined group amounted to 10.39 ± sec. 0.84 sec., whereas the average result of the measurement in case of girls from the control group was higher and amounted to 12.35 sec. ± 1.46 sec. The average result of the measurement of the time in case of boys from the examined group amounted to 9.97 sec. ± 1.37 sec., whereas the average result of the measurement in case of boys from the control group was higher and amounted to 11.03 sec. ± 1.19 sec. (tbl. 10., fig. 14, 15).

Moreover a participation was demonstrated essential statistically relations between results achieved in the test on the gear on 50 m by girls and boys from the control group (p = 0.016) (tbl. 11.).

A participation was demonstrated essential statistically of differences between the result achieved in the attempt of strength of the belly muscles by girls from the examined and test group (p = 0.015), whereas indeed sta-

TABLE 11
TESTS OF THE GRAVITY FOR THE RUN ON 50 M IN CASE OF OTHER COMBINATIONS AMONG GROUPS AND THE SEX

Steam of variables	t	p
Girls of the swimmer – boys swimmers	0.87	0.389
Test girls – test boys	2.56	0.016

t – result of t – Student test for an operands; p – level probabilities

TABLE 12
STRENGTH OF THE BELLY MUSCLES

Strength of the belly muscles [number of repeating / 30 sec.]		Descriptive statistics						
		n	$\bar{x}$	My	Min.	Max.	SD	p
Girls	Swimmers	10	23.60	22.00	20.00	35.00	4.35	t = 2.69 p = 0.015
	Control	10	19.20	19.50	14.00	23.00	2.78	D = 4.40 WD = 1.01
Boys	Swimmers	17	22.59	23.00	16.00	28.00	3.12	t = 1.08 p = 0.290
	Control	17	21.18	22.00	13.00	29.00	4.42	D = 1.41 WD = 0.45

n – number of observations; $\bar{x}$ – arithmetic mean; Me – median; Min-minimum; Max-maximum; Q1 – bottom quartile; Q3 – upper quartile; SD – standard deviation; WD – Mollison indicator
t – result of t – Student test for an operands; p – level probabilities
Source: own study

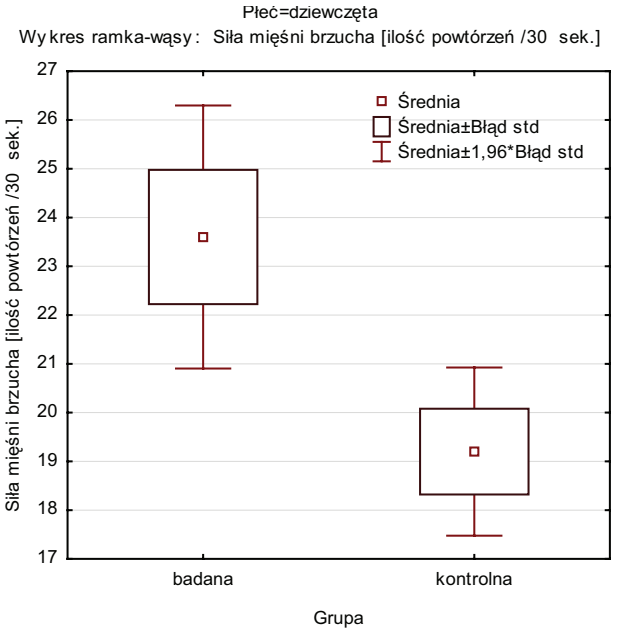

Fig. 16. Strength of the belly muscles amongst girls from the group examined and test.

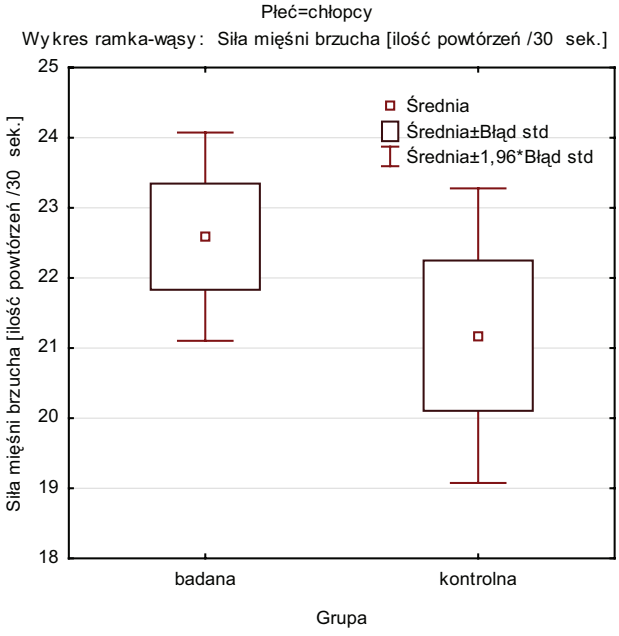

Fig. 17. Strength of the belly muscles amongst boys from the group examined and test.

tistically results achieved by boys from the examined and test group didn't differ (p = 0.290). Girls from the examined group made during 30 seconds on average about 24 of repeating, whereas girls from the control group on average about 19 of repeating. Boys from the examined group made on average about 23 of repeating, whereas boys from the control group about 21 of repeating (tbl. 12., fig. 16, 17).

Moreover a participation was demonstrated essential statistically relations between results achieved in the attempt of strength of the belly muscles by girls and boys from the control group (p = 0.021), where boys achieved good results. (tbl. 13).

A participation was demonstrated essential statistically of differences between the result achieved in the attempt of the suppleness by girls from the examined and test group (p = 0.041) and from the group examined by boys and test (p = 0.004). The average result of girls from the examined group was 7.5 cm ± 5.52 cm, average result

TABLE 13
TESTS OF THE GRAVITY FOR STRENGTH OF THE BELLY MUSCLES IN CASE OF OTHER COMBINATIONS AMONG GROUPS AND THE SEX

Steam of variables	t	p
Girls of the swimmer – boys swimmers	0.70	0.488
Test girls – test boys	–1.26	0.021

t – result of t – Student test for an operands; p – level probabilities
Source: own study

TABLE 14
SUPPLENESS

Suppleness [cm]		Descriptive statistics						
		n	$\bar{x}$	My	Min.	Max.	SD	p
Girls	Swimmers	10	7.50	7.50	0.00	17.00	5.52	t = 2.20 p = 0.041
	Control	10	0.60	2.50	–17.00	9.00	8.24	D = 6.9 WD = 1.25
Boys	Swimmers	17	3.59	3.00	–11.00	11.00	5.67	t = 3.07 p = 0.004
	Control	17	–3.06	-4.00	–14.00	7.00	6.91	D = 6.65 WD = 1.17

n – number of observations; $\bar{x}$ – arithmetic mean; Me – median; Min-minimum; Max-maximum; Q1 – bottom quartile; Q3 – upper quartile; SD – standard deviation; WD – Mollison indicator
t – result of t – Student test for an operands; p – level probabilities
Source: own study

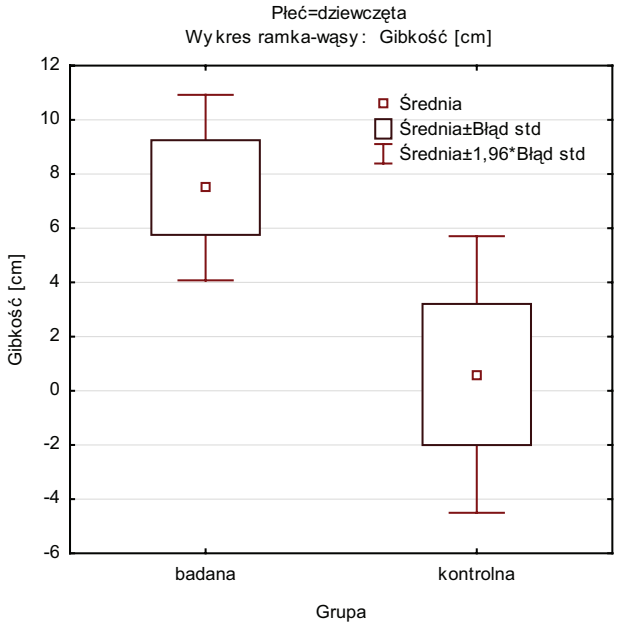

Fig. 18. Suppleness amongst girls from the group examined and test.

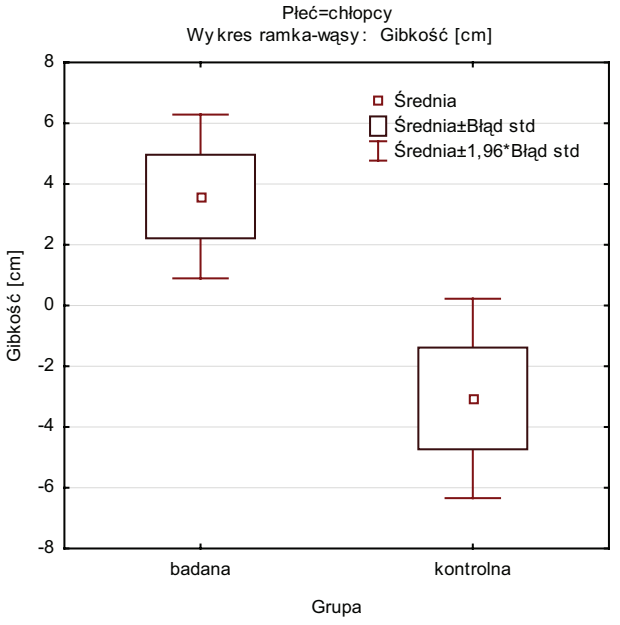

Fig. 19. Suppleness amongst boys from the group examined and test.

of girls from the control group was 0.6 cm ± 8.24 cm, average result of boys from the examined group was 3.59 cm ± 5.67 cm and the average result of boys from the control group -3.06 cm ± 6.91 cm (tbl. 14, fig. 18, 19).

Moreover a participation was demonstrated essential statistically of difference between the result achieved in the attempt of the suppleness by girls from the examined group and boys from the group examined ($p < 0.001$). Indeed higher results got girls (tbl. 15).

Relations occurring between the result of fitness tests and the size of the Rohrera indicator amongst examined girls and boys from the examined and test group were subjected to the evaluation.

A participation was demonstrated essential statistically of positive relations, between the size of the Rohrer indicator and the result of the test on the pendular gear amongst boys from the swimming group ($r = 0.6$; $p = 0.010$), between the size of the Rohrer indicator and the result of the test on

TABLE 15
TESTS OF THE GRAVITY FOR THE SUPPLENESS IN CASE OF OTHER COMBINATIONS AMONG GROUPS AND THE SEX

Steam of variables	t	p
Girls of the swimmer – boys swimmers	1.74	0.092
Test girls – test boys	1.23	0.226

t – result of t – Student test for an operands; p – level probabilities
Source: own study

TABLE 16
EVALUATION OF THE RELATION BETWEEN THE SIZE OF THE ROHRER INDICATOR AND RESULTS OF FITNESS TESTS

Rohrer indicator		The long jump from the place [cm]		Pendular run 4 x of 10 m [sec.]		Run on 50 m [sec.]		Strength of the belly muscles [number of repeating / 30 sec.]		Suppleness [cm]	
		R	p	r	p	r	p	r	p	r	p
Girls	Swimmers	–0.78	0.007	0.22	0.536	0.52	0.116	0.35	0.319	–0.05	0.889
	Control	–0.23	0.512	0.20	0.561	0.28	0.431	–0.06	0.857	0.26	0.456
Boys	Swimmers	–0.76	<0.001	0.60	0.010	0.69	0.002	–0.52	0.032	–0.30	0.241
	Control	0.07	0.779	–0.03	0.891	–0.05	0.826	0.22	0.395	0.55	0.019

t – result of t – Student test for an operands; p – level probabilities
Source: own study

the gear on 50 m amongst boys from the group examined (r = 0.69; p = 0.002) and between the size of the Rohrer indicator and the result of the attempt of the suppleness amongst boys from the control group (r = 0.55; p = 0.019). Positive correlations indicated an increase in number of one examined variable along with an increase in number of the second examined variable, and therefore for them a Rohrer indicator was higher in case of examined persons all the higher they performed in the test on the pendular gear, of run on 50 m and in the attempt of the suppleness.

A participation was also demonstrated essential statistically of negative relations, between the size of the Rohrer indicator and the result of the attempt of the long jump right away amongst girls from the group examined (r = -0.78; p = 0.007) and amongst boys from the group examined (r = -0.76; p < 0.001) as well as between the size of the Rohrer indicator and the result of the attempt of strength of the belly muscles amongst boys from the group examined (r = -0.52; p = 0.032). Negative correlations indicated an increase in number of one examined variable along with the decline in value of the second examined variable, and therefore for them a Rohrer indicator was higher in case of examined persons all the lower they performed in for attempt of the long jump right away and in the attempt of strength of the belly muscles (tbl. 16). Essential correlations statistically were described on scatter diagrams. On this graph points (marking next persons) negotiate along the line of the regression in direction up (in case of positive correlations) be in direction into the bottom (in case of negative correlations). With broken line a 95.0% was indicated confidence interval for the average (fig. 20,21,22 fig., 23, 24.25.).

Discussion

In ancient times they didn't know about the physical development of the man a lot. It wasn't written also about developing in earlier lifespans as well as about changes in proportion of children. In the Middle Ages they investigated the laws concerning the height of the body thinking that the child from the conception is a miniature man – homunculus.

About precursors of the research on the development of the child in XVI recalls the 17th century M. Ćwirko-Godycki (Malinowski 1976). They were, it is J. L. Vivies (1492 – 1540) and J. A. Comenius (1592 – 1670). For the child a work published in 1753 in Goettingen talks about physics norms through J. G. Roederer[8].

An increased pace of growing and the development of the man and reaching greater dimensions of the body inspired the interest of anthropologists, doctors and teachers. A. Malinowski recalls in „Anthropological Inspection" (1977) about pioneers – researchers in Europe so as: in England K. Person and A. Lee, of Norway – V. Kill. In the Bydgoszcz area at conscripts dealt with happening changes Piontek and Kozłowski[9].

In Poland enough development measurements have a rich tradition physical of children and young people. By the XIX end and at the beginning of the relations concerning the 20th century of the first effort of examinations of genetic traits and factors społeczno – welfare at conscripts in Poland made a note K. Kosieradzki, J. Czekanowski and J. Mydlarski.

With research on secular changes (that is concerning the acceleration of the pace of the biological development of the man about long-term character) in the development of children and Polish young people J. Bogdanowicz did and are initiators standing out and the contents of these examinations Z. Bocheńska, N. Wolański, Ćwirko-Godycki, Jasicki K. and E. Stołyhwów, H. Milicerowa, R. Trześniowski, R. Przewęda, S. Pilicz and Z. Chromiński[8].

A World War II suspended these works, and in a few cases they had fragmentary character. They sought more and more excellent centers counteracting adverse conditions of the development of the child. A development of examinations took place in all countries of Europe and America. To interesting French experiments initiated in 1950 in Vauves were included. „For me – temps pedagogic ah sportifs" – it is a regular hourly division into theoretical and motor classes along with the rest and young people provided with this experiment achieved higher results in the learning and turned out to be healthier and better developed in terms of physics[12].

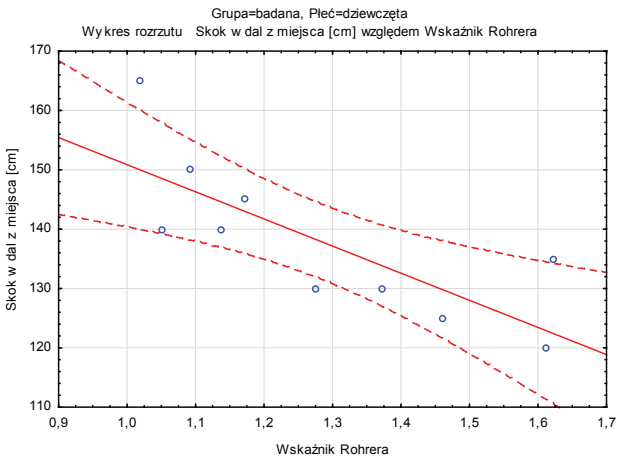

Fig. 20. The Rohrer indicator but the result of the long jump amongst girls from the swimming group.

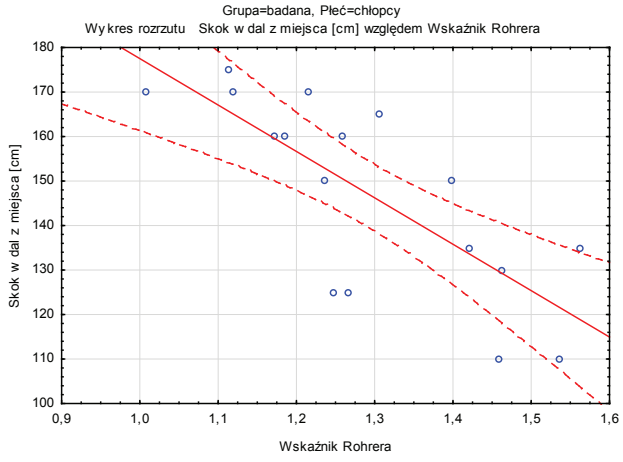

Fig. 21. The Rohrer indicator but the result of the long jump amongst boys from the swimming group.

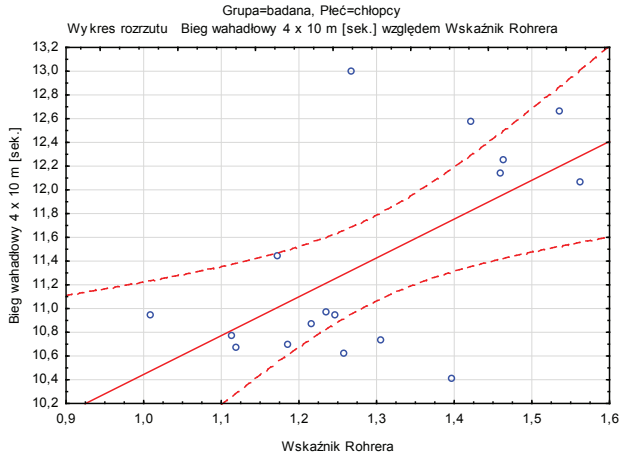

Fig. 22. The Rohrer indicator but the result of the pendular run amongst boys from the swimming group.

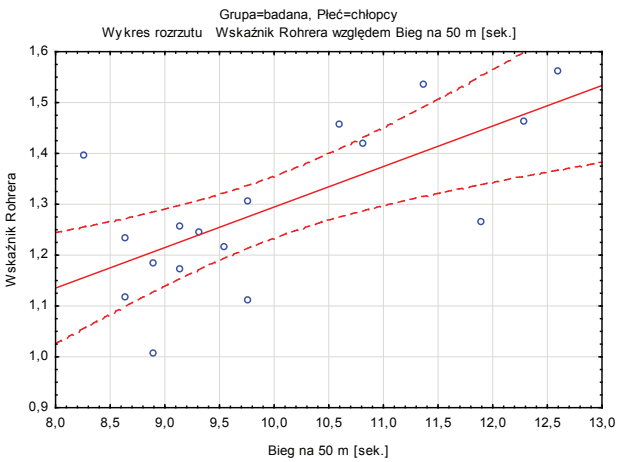

Fig. 23. The Rohrer indicator but the result of the run on 50 m amongst boys from the group examined.

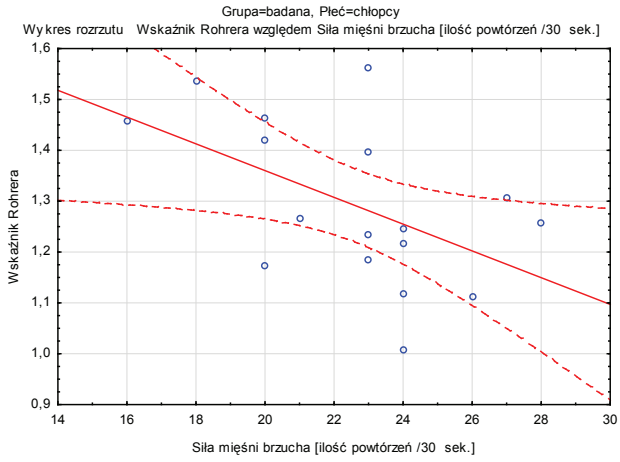

Fig. 24. The Rohrer indicator but strength of the belly muscles amongst boys from the group examined.

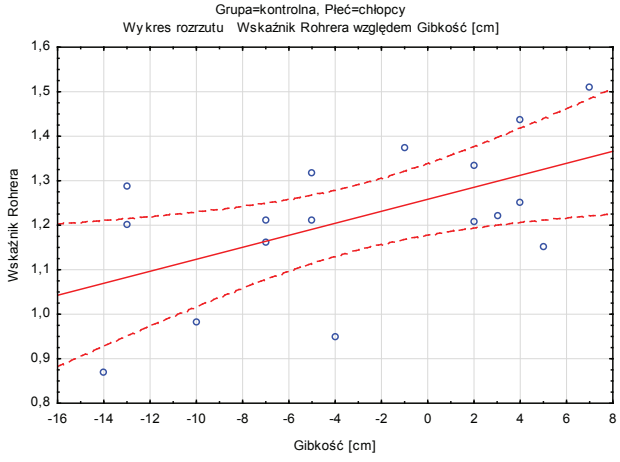

Fig. 25. The Rohrer indicator but the result of the suppleness amongst boys from the control group.

Issues of simultaneous growing of somatic features and the physical fitness were an object of works N. Wolański (2006)[11]. They also dealt with works covering periods of the ontogenesis H. Gniewkowska, S. Moliere and Demel M., Gniewkowska H., Moliere. By establishing the optimum age for managing the process of the sports training of children and young people among others J. Raczek did. With factors morfofunkcjonalnymi deciding on the endurance of girls and J. Drabik and R. Przewęda and R. Trześniowski dealt with the somatic conditioning of children and young people śniowski. Motor and physical development children of young people pose border, we can trace Poland at works are. Malina, J. Bergier, Bergier and Kasa[13].

They determined the dependence of the degree of the physical fitness on somatic ripening in their examinations m aka: M. Skład[14], S. Janowski et al.[15], H. Milicer[16], S. Pilicz[17]. In the light of secular trends and social differences she dealt with changes in the ontogenesis of the man among others Z. Bochnia (1978). It results from the majority of examinations, that children having a worse standard of living, they develop and grow more poorly, than children coming from circles about the economic high level.

It is possible to record considerable traditions of examinations and exploiting them in practice in the kujawsko-pomorski region school. It is worthwhile also emphasizing in this place that the kujawsko-pomorski province from a sociological point of view belongs to regions, being located in average periods of all sociological parameters of Poland what can provide about specific »typicalities« of phenomena, also of the ones provided with examinations.

For the oldest examinations made a note concerning the physical development of children and young people in the region kujawsko – pomorskie examinations conducted in the years 1919 are included – of 1938 by Jax-Bykowski. Smaller widely examinations (spreading through only a Tuchola district), but concerning anthropological measurements, in 1924 A. Warszak[18].

On considered areas J. Mydlarski conducted deeper examinations in 1932, and findings of his examinations served the physical fitness of Polish young people for drawing the measure of the development up[19].

The research on the biological value of the young generation in the Bydgoszcz region was conducted in 1951 as part of all-Polish examinations. From 1946 in the province Pomeranian (eighteen districts) there were conducted examinations through R. Trześniowski.

Numerous works associated with anthropological examinations of young people of secondary schools rose from the Bydgoszcz area. Changes which in the course of a dozen or so years took place in the physical development and the efficiency of young people were a research problem.

S. Strzyżewski stated, that exercises rekreacyjno – sports one should think (…) not only behind the individual stimulant somatic and motor development, but also behind the agent of the intensification of psychological rest which creates conditions of the better white-collar work. The author noticed also a need of the research on the effectiveness of extracurricular classes and their influence on shaping attitudes of pupils[20]. He stated that creating the whole of pupils at schools of conditions for the increased motor activity improved their efficiency and the adaptability for variations of the terms of the environment.

It conducted the widest research on the physical development and the efficiency in the Bydgoszcz region (currently kujawsko-pomorski province) G. Nowicki (1983)[21]. In 1971 he embraced with them above 41 000 of pupils from schools of all types.

Because (…) the topicality of examinations towards the majority takes the guild out 10 years (Malinowski 1977, 1980, p. 5, 1993) a need of bringing these examinations up to date arose. They also justify them (…) systematically changing environmental conditions and welfare, which the younger generation of Poles unrolls in (Nowicki 1983, p. 9)[21].

G. Nowicki (1996)[22] made an attempt of grabbing hold of of changes in the physical and motor development children and young people in the Bydgoszcz region in the period of 34 last years. Made comparisons pointed at appearing of the relation between social-welfare, health and demographic conditioning, but secular changes heights and body weights. Findings depicted the slower reaction of girls to environmental influences.

From 1990 to 2002 G. Nowicki (2004) conducted examinations of the somatic development of children and young people coming from the urban environment and the country. Determining differences were their purpose wewnątrzśrodowiskowych in the physical development of children (from the birth) and of young people in the country environment and determining the connection of families between the exchanged development and the socioeconomic situation examined.

G. Nowicki (2006) described the physical development of children and young people from the province kujawsko – pomorskie in the light of choosing developmental indicators (of the proportion of somatic features, dynamics of the development, the pace of the development of values of standardized morphological features, the sex dimorphism, the state of the biological maturity, the state of the health of children and young people in the light of groups dyspanseryjnych). Presented material has a great practical significance, because constitutes a biological frame of reference, being able to be used for an evaluation of the physical development of children and young people of the region.

From 1995 works on the physical development of children from the province kujawsko – Pomeranian an Institute of the physical culture conducts Kazimierz Wielki at university in Bydgoszcz. Numerous publications are a fruit of these works Napierała 1997, 2000, 2005, 2008, Zasada 1999)[8,13,23,24]. They were drawn up through M. Napierała of the norm of the physical development and abilities of motor children from classes on the teaching integrated as the help of teachers, but unfortunately without taking the biological age into account.

About the all-Polish reach recalled J. Mydlarski and the continuator of the subject dealt with the issue of the physical development and the efficiency R. Trześniowski

(1961, 1963 ah, 1990). A measure of the physical fitness of pupils and pupils became a fruit of his examinations in the century 7.5 – 18.5 of years. Interesting findings, concerning comparisons of the somatic and motor development, it is possible to find in follow-up works (Przewęda, Trześniowski 1996, Przewęda 2002, Przewęda, Dobosz 2003, Stupnicki 2005)[25,26,27,28].

Findings from 1999 (Przewęda, Dobosz 2003)[27], covering also kujawsko-pomorski province, brought the image of the contemporary Polish young generation. Observed differences międzyregionalne in the somatic and motor development were recognized as the image of the population given to the social and economic situation.

Diversifying provincial average results of the height of both the body weight of boys and girls were noticed. Data pointed at the majority in the physical development of young people from Poland Central, including from the kujawsko-pomorski province. In spite of the majority of somatic features motor abilities develop in the diversified way. R. Przewęda and J. Dobosz (2003) stated, that in compared signs of motor boys, as: attempt of the suppleness, high-speed and endurance abilities examined from the kujawsko-pomorski province they are located in average all-Polish results, however in weight abilities run away disadvantageously from these averages. Girls in measurements of the suppleness, high-speed and weight abilities they are in an average period, and in endurance abilities are no match for peers from other provinces[8].

The research on somatic features also includes the professional sport. With predictions of the development and his influence on sporting achievements to find it is possible in every discipline: in the football (Czerniak et al. 2006)[29], in the rowing and the canoeing (Skład, Krawczyk, Mayle 1994), in karate (Sterkowicz, Żarow 1994)[30], in the field hockey (Szymańska-Parkieta, Gałecka 1994)[31], triathlon (Grądecka 1996)[32], for fencer (Borysiuk 2001)[33], speedway sport (Kowalewska 2002)[34], M. Zasada (1993, 1999)[24,35] in the gymnastics or the sports dance (Pilewska 2002)[36]. They are these are only examples of disciplines and works taking this subject matter (Napierała, Szark-Eckardt 2015)[37].

In spite of significant academic achievements in the field of getting to know the phenomena concerning the physical and motor development, a need exists more distant of monitoring them, because the discussed subject matter is still important and not entirely examined (Drozdowski 1975, 1980)[38,39].

Conducted examinations and their results can serve in developing norms of the age for children determined. They can turn out helpful in the schoolwork of game teachers, which – taking the norm for the base – various components of the biological development can better and more effectively control their charges, in particular in changing conditions of organizational schools. Furthermore, drawing up and popularizing such norms can constitute valuable material documentary, serving better getting to know about the biological value the younger generation from the kujawsko-pomorski region. They constitute the fraction of the research on somatic features and motor abilities which satisfy the curiosity about game teaches.

Conclusions

Test results entitle to draw the following conclusions:

Development of somatic features so as the height of the body and the body weight is typical of the age of all children examined. In the group of swimming and not-swimming children they were different in measurements of the height and the body weight to the benefit of none from examined groups. Calculated rates weren't also different in the somatic development of children tested.

The level of motor features was verified more favorably for children practicing swimming. In attempts of agility, speed, strength of the belly muscles and the suppleness better boys and girls fall out of the examined group. Only in the attempt of power (the long jump from the place) results of both groups are moved closer.

Examining correlation showed the existence of the relation between results of some tests of the physical fitness and the Rohrer indicator. Positive correlations occurred in attempts – pendular run, run of 50 m, suppleness. Negative correlations occurred in attempts – the long jump from the place, the strength of the belly muscles.

Differences in the results of the physical fitness, a class of the physical education at the greater, week's hourly dimension can result from the fact that children practicing swimming have. These classes have character of going in for specific sports discipline what the methodology of giving classes and the selection of training burdens is connected with. However, children from the general class undergo the standard number of hours of the physical education, and these classes are much more diversified, led very generally, with the orientation to the physical culture, rather than the practicing sport.

Declarations

Ethics approval and consent to participate

The research related to human use complied with all the relevant national regulations, institutional policies, and was in accordance with the tenets of the Helsinki Declaration. The study protocol was approved by the Ethical Committee of Kazimierz Wielki University, Bydgoszcz, Poland.

During realization of tests, all participants provided informed consent and used all measures for maintaining anonymity of participants.

Consent to publish

Not applicable

Competing interests

The authors declare that they have no competing interests.

Conflicts of interest

All authors have no conflicts of interest to declare.

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Authors' contributions

MS-E, MN, JE, RŁ participated in the design of this study. MS-E, MN, RŁ performed the statistical analyses. MS-E, MN, JE, WZ, RŁ drafted the manuscript. MS-E, MN, JE, WZ, RŁ were involved in data collection and/or made important intellectual contributions to the interpretation of data and the writing on paper. All authors critically revised and approved the final version.

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W. Zukow,

Faculty of Earth Sciences,Nicolaus Copernicus University, ul. Gagarina 11, 87-100 Toruń, Poland
E-mail: w.zukow@wp.pl,

SOMATSKE KARAKTERISTIKE I MOTORIČKI KAPACITET 10-GODIŠNJAKA PLIVAČA U BAZENIMA IZ OSNOVNE ŠKOLE BR. 60 U BYDGOSZCZU

SAŽETAK

Cilj istraživanja bio je odrediti stanje somatskih svojstava i motoričkih sposobnosti desetgodišnjih učenika iz Osnovne škole br. 60 u Bydgoszczu. Ispitivane su dvije skupine djece – plivanje i neplivače. Bilo je pet pokušaja iz International Physical Fitness Test za procjenu motoričkih sposobnosti kao što su snaga, agilnost, brzina, snaga trbuha, fleksibilnost. Visina tijela, tjelesna težina, BMI, Rohrer parametri korišteni su za procjenu somatskih svojstava. Ukupan broj učenika bio je 54 učenika, 34 dječaka i 20 djevojaka. Svaki od studenata izvodi pet fitnes testova. Istraživačka hipoteza je da će djeca koja plivaju pokazivati bolju fizičku kondiciju od djece koja ne plivaju i da se dvije skupine neće razlikovati s obzirom na somatske osobine.