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CHARACTERISTICS OF BODY POSTURE IN THE SAGITTAL PLANE AND FITNESS OF FIRST-FORM PUPILS FROM RURAL AREAS

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Annotation. Purpose: to find correlations between characteristics of body posture in the sagittal plane and fitness and endurance of first-form children from rural areas. Material: an analysis of more than 30 sources of scientific and educational literature. Results: the study involved 209 children, including 102 girls and 107 boys. They were children who lived in the country since they were born. To assess particular characteristics of body posture, the children were studied by means of the measuring equipment using the projection Moiré system. Motor skills were estimated using selected EUROFIT physical fitness tests (sitting forward bend, standing broad jump, handgrip, sit-and-reach, bent arm hang and 10 x 5 m shuttle run). The level of physical endurance was evaluated with the Harvard Step Test modified by Montoye. Conclusions: the conducted research reveals statistically significant correlations between the characteristics of body posture in the sagittal plane and selected EUROFIT physical fitness tests and physical endurance of the children involved in the study.
Keywords: EUROFIT, correlations, physical endurance, circulatory system, spinal.

Introduction

The current generation of children and teenagers is becoming more robust as Przewęda and Dobosz report [24]. As far as physical development is concerned, an increase in the body height and weight is observed in the young generation. However, as the authors report, the morphological development and its acceleration do not go together with acceleration of physical endurance and fitness. Visible regress can be observed within these indicators [24], which is especially noticeable among rural teenagers and in families of lower social status [17, 24, 25]. Numerous researchers [2, 9, 16, 17, 24, 27, 30] emphasise the influence of environment on the level of biological development and health condition of children and teenagers. As the authors suggest, this decrease in physical endurance and fitness can be also caused by the constant development of mechanization, urbanization and technology. Civilization progress facilitates everyday life but it also reduces people's physical exercise, what leads to a sedentary lifestyle and, in consequence, to different civilization disorders (e.g. obesity).

Human adaptation mechanisms do not keep up with the dynamic development of environment. In case of teenagers and children, inability to adjust to a big number of stimuli and lack of movement lead to mental disorders (e.g. neuroses) and cause reduced fitness and endurance. This in turn causes decreased immunity which results in pain troubles of the motor system (mainly pain of the cervical and lumbar spine). Disorders of adaptation mechanism in children and teenagers are revealed, among others, by the "epidemic" of faulty postures and lower extremity postural distortions as numerous studies indicate [6, 10, 11, 20, 22, 24, 29]. Therefore, as far as health promotion is concerned a special role should be played by positive health indicators which may comprise the evaluation criteria of the population health condition. These include physical development, physical activity, physical endurance and fitness, among others [7]. The indicators reflect the work of human organs and systems as well as they require constant diagnosing and monitoring. Hence, significant as it seems to be is that particularly children should be subject to constant control towards positive health indicators. Additionally, the body posture of a child expresses its mental and physical state. Anomalies, distortions and faulty postures have an influence on physiological and motor functions of a human, for example, distortions in the thoracic region negatively affect the lungs and heart work and, in consequence, they lead to circulatory and respiratory impairment. Defects in the region of knees impair a child's motor activity whereas in the region of feet they reduce a child's support and marching activities [23].

Methods

Children studied

The research involved 270 pupils, but finally, there were used the results of 209 children who participated in all research stages and were given their parents' consent. Having divided the children according to their sex the study involved: 102 girls and 107 boys. The children involved in the study lived in the country since they were born (Table 1).

Table 1

Statistical description of the children involved in the study

PLACE OF RESIDENCE	BOYS		GIRLS		TOTAL	
	n	%	n	%	N	%
Dąbrowa Chełmińska	30	46.9	34	53.1	64	30.6
Nowa Wieś Wielka	63	57.8	46	42.2	109	52.1
Wojnowo	14	38.9	22	61.1	36	17.2
TOTAL	107		102		209	

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The research was conducted in three rural schools of the Kuyavia-Pomerania Province: Dąbrowa Chełmińska, Nowa Wieś Wielka and Wojnowo. Children from the neighbouring rural areas were driven to schools.

Research Organisation

The rural schools of the Kuyavia-Pomerania Province which were attended by the studied children were chosen using a random search method [14].

The research involved the evaluation of body posture and assessment of motor skills and physical endurance of the children. The evaluation of body posture was conducted at the Body Posture Laboratory of the AWFiS (University of Physical Education and Sport) in Gdansk whereas the study of motor skills of boys and girls was carried out in sports facilities belonging to schools attended by the children involved in the study. During the study of body posture it was essential for a studied person to assume a free, unconstrained standing position with slightly extended legs, straight knee and hip joints, with arms loosely lowered along the trunk and the head in the Frankfurt plane [19, 31]. The evaluation of body posture was conducted in a properly adapted room (lighting, temperature) in the morning.

Body posture evaluation

The study of body posture was conducted at the Body Posture Laboratory of the AWFiS (University of Physical Education and Sport) in Gdansk using the projection Moiré system. The applied computer system provided three-dimensional coordinates of the studied regions and calculated the parameters of body posture in the sagittal plane at the same time. Having prepared the data, there were obtained 50 parameters of linear and angular posture dimensions. For the purpose of the study, the following data characterizing body posture in the sagittal plane of the studied rural children were applied: angles of depression of the particular spinal sections (degrees): upper thoracic γ, thoracic-lumbar β, lumbar-sacral α and the angle of pelvic anteversion in the sagittal plane (degrees).

Taking the measured angles into consideration, angular dimensions were assessed and small, big and medium angles were determined [18]. Using the Wolański method completed by Zeyland-Malawka [31] the types of posture were determined. Numeric values were also evaluated for: thoracic kyphosis (χ), lordosis (λ), total spinal curvatures (δ) and compensation index (μ).

In order to standardize terminology for the purpose of this scientific paper, the nomenclature of spinal angles presented by Zeyland-Malawka [31] was used. The calculated size of angle α, which means the depression angle of the lumbar-sacrum section according to the Świerc system, determines in this paper the depression angle of the upper thoracic section, angle β – the depression angle of thoracic-lumbar spine remains the same whereas angle γ, which means the depression angle of the upper thoracic section according to the Świerc system, means the depression angle of the lumbar-sacral section in this publication.

Evaluation of fitness and physical endurance

Fitness was examined using selected tests of the EUROFIT physical fitness test and the tests were conducted in accordance with generally binding rules [8].

To evaluate the fitness level the following tests were applied: sitting forward bend, standing broad jump, handgrip (with the stronger hand), sit-and-reach within 30s, bent arm hang and 10 x 5m shuttle run.

In order to estimate the endurance level of the studied boys and girls, the Harvard Step test was applied, which was modified by Montoye and used in the research study of Polish children by Mazur et al. [15]. This test also reveals the response of cardiac contraction frequency in children during an exercise and after one-minute rest. This test was determined as the Exercise Test in Step-Test. The exercise test used in the step-test was conducted in accordance with recommendations of Mazur et al. [15] for the Harvard Step Test, adapted for children. The exercise took 5 minutes and during this time the studied person stepped up and down at a rate of 30 steps per minute. The pulse was taken by means of a heart rate monitor Polar – S810i one minute after the exercise.

The endurance index was evaluated and for the analysis purpose there were used the endurance criterion (Table 2) proposed by Mazur et al. [15].

Table 2

Physical fitness criteria developed by Mazur et al. (1975)

Endurance index	Endurance rating
Above 60	excellent
50.1 – 60.0	good
40.1 – 50.0	average
30.1 – 40.0	low average
Below 30	poor

Source: Mazur et al. (1975)

Results

Correlations of the characteristics of body posture in the sagittal plane with motor skills in boys and girls

The results achieved by the studied boys in the bent arm hang test reveal a statistically significant correlation at the assumed level $\alpha = 0.05$ with the upper thoracic angle – α (poor correlation r = - 0.19 and thoracic-lumbar angle – β (moderate correlation r = -0.3). These correlations are opposite (when one variable increases – the duration of the hang, the second one decreases – the alpha angle, the beta angle). There is a poor, but statistically insignificant correlation between the time of hang of the boys involved in the study and the angle of pelvic anteversion (r = 0.18) (Table 3).

Table 3

Correlations occurring between the angles characteristic of anterior-posterior pelvic tilts (upper thoracic - α, thoracic-lumbar - β, sacral-lumbar γ) and the angle of pelvic anteversion in the sagittal plane and the bent arm hang test in the studied boys

BOYS					
Bent Arm Hang (s)		Angle			**Angle of (pelvic) anteversion**
		α	β	γ	
	r	-0.19	-0.3	-0.05	0.18
	Correlation power	***poor***	***average***	hardly Any	low
	t	1.98	3.2	0.47	1.86
	Statistical significance	**α = 0.05**	**α = 0.05**	lack	lack

Table 4 reveals correlations between the analysed angles in the sagittal plane and the sit-and-reach test (Table 4).

Table 4

Correlations occurring between the angles characteristic of anterior-posterior pelvic tilts (upper thoracic - α, thoracic-lumbar - β, sacral-lumbar γ) and the angle of pelvic anteversion in the sagittal plane and the sit-and-reach test in the boys involved in the study

BOYS					
Sit-and-Reach (number)		Angle			**Angle of (pelvic) anteversion**
		α	**β**	**γ**	
	r	-0.13	0.04	-0.26	-0.06
	Correlation power	poor	hardly any	***poor***	hardly any
	t	1.4	0.42	2.74	0.57
	Statistical significance	lack	lack	***α = 0.05***	lack

When analysing the findings, there can be defined a statistically significant correlation at the assumed level α = 0.05 between the sit-and-reach test and the lumbar-sacral angle - γ (poor correlation r = - 0.26). This correlation is of an opposite character. Additionally, a low, but statistically insignificant correlation was determined between the sit-and-reach test and the upper thoracic angle - α (r = - 0.13).

As the analysis of the results revealed in table 5 suggests, it appears that the bend forward test correlates only with the thoracic-lumbar angle – β at a low level and turned out to be statistically insignificant (r = 0.16).

Table 5

Correlations occurring between angles characteristic of anterior-posterior pelvic tilt (upper thoracic - α, thoracic-lumbar - β, sacral-lumbar γ) and the angle of pelvic anteversion in the sagittal plane and the sitting forward bending test in the boys involved in the study

BOYS					
Sitting forward bending (cm)		**Angle**			**Angle of (pelvic) anteversion**
		α	**β**	**γ**	
	r	0.07	0.16	-0.01	0.05
	Correlation power	hardly any	*poor*	hardly any	hardly any
	t	0.71	1.67	0.09	0.54
	Statistical significance	lack	lack	lack	lack

Between the shuttle run test and spinal angles in the sagittal plane (Table 6) there was noticed one statistically significant correlation, that is with the lumbar-sacral angle γ (poor correlation r = 0.23). This correlation is consistent. Apart from that, low correlation can be noticed between the shuttle run test and the upper thoracic angle - α (r = 0.18), the thoracic-lumbar β (r = 0.1) and the angle of pelvic anteversion (r = -0.12). However, these correlations are lower and statistically insignificant.

Table 6

Correlations occurring between the angles characteristic of anterior-posterior pelvic tilts (upper thoracic - α, thoracic-lumbar - β, sacral-lumbar γ) and the angle of pelvic anteversion in the sagittal plane and the shuttle run 10 x 5 test in the boys involved in the study

BOYS					
Shuttle Run 10 x 5 (s)		**Angle**			**Angle of (pelvic) anteversion**
		α	**β**	**γ**	
	r	0.18	0.1	0.23	-0.12
	Correlation power	*poor*	*poor*	***poor***	*poor*
	t	1.85	1.01	2.42	1.21
	Statistical significance	lack	lack	***α = 0.05***	lack

The standing broad jump test, at a low level, insignificantly correlates with the upper thoracic angle - α (r = - 0.1) and the lumbar-sacral angle γ (r = - 0.12) (Table 7).

Table 7

Correlations occurring between the angles characteristic of anterior-posterior pelvic tilts (upper thoracic - α, thoracic-lumbar - β, sacral-lumbar γ) and the angle of pelvic anteversion in the sagittal plane and the standing broad jump test in the boys involved in the study

BOYS					
Standing Broad Jump (cm)		**Angle**			**Angle of (pelvic) anteversion**
		α	**β**	**γ**	
	r	-0.1	0.04	-0.12	-0,001
	Correlation power	*poor*	*hardly any*	poor	hardly
	t	1.02	0.4	1.19	0,02
	Statistical significance	lack	lack	lack	lack

While analysing the results revealed in table 8 it appears that there are low, but statistically insignificant correlations between the handgrip test and the upper thoracic angle α (r = 0.12) and the angle of pelvic anteversion (r = 0.13), likewise, within the correlations between the Step-test and the spinal angles in the sagittal plane there can be noticed a low (r = - 0.18), statistically insignificant correlation with the upper thoracic angle - α (Table 8, 9).

Table 8

Correlations occurring between the angles characteristic of anterior-posterior pelvic tilts (upper thoracic - α, thoracic-lumbar - β, sacral-lumbar γ) and the angle of pelvic anteversion in the sagittal plane and the handgrip test in the boys involved in the study

BOYS					
Handgrip Test (KG)		**Angle**			**Angle of (pelvic) anteversion**
		α	**β**	**γ**	
	R	0.12	-0.02	-0.03	0.13
	Correlation power	*poor*	hardly any	hardly any	*poor*
	T	1.2	0.25	0.31	1.35
	Statistical significance	lack	lack	lack	lack

Table 9

Correlations occurring between the angles characteristic of anterior-posterior pelvic tilts (upper thoracic - α, thoracic-lumbar - β, sacral-lumbar γ) and the angle of pelvic anteversion in the sagittal plane and the number of points scored in the Step-test in the boys involved in the study

BOYS					
Step-test (points)		**Angle**			**Angle of (pelvic) anteversion**
		α	**β**	**γ**	
	r	-0.18	-0.03	0.03	0.001
	Correlation power	*poor*	hardly any	hardly any	hardly any
	t	1.87	0.34	0.30	0.04
	Statistical significance	lack	lack	lack	lack

The results achieved by the girls involved in the study in the bent arm hang test do not significantly correlate at the assumed level α = 0.05 with any of the independent variables. Poor, but statistically insignificant correlations were defined between this test and the upper thoracic angle – α (r = 0.11), the thoracic-lumbar angle - β (r = 0.19) and the lumbar-sacral γ (r = 0.13) (Table 10).

Table 10

Correlations occurring between angles characteristic of anterior-posterior pelvic tilts (upper thoracic - α, thoracic-lumbar - β, sacral-lumbar γ) and the angle of pelvic anteversion in the sagittal plane and the number of points scored in the bent arm hang test in the girls involved in the study

GIRLS					
Bent Arm hang (s)		**Angle**			**Angle of (pelvic) anteversion**
		α	**β**	**γ**	
	R	0.11	0.19	0.13	-0.19
	Correlation power	poor	poor	poor	hardly any
	T	1.07	1.95	1.35	0.98
	Statistical significance	lack	lack	lack	lack

When examining the results of the correlations between the sit-and-reach test and the spinal angles in the sagittal plane (Table 11) there can be defined a statistically significant correlation at the assumed level α = 0.05 with the following parameters: the thoracic-lumbar angle – β (average correlation r = 0.32) and the angle of pelvic anteversion (poor correlation r = -0.22). The correlation between the above mentioned test and the angle β is consistent (when one variable increases and so does the second one) whereas the second correlation is of an opposite character. A poor but statistically insignificant correlation was defined between the sit-and-reach test and the upper thoracic angle (r = 0.12).

Table 11

Correlations occurring between the angles characteristic of anterior-posterior pelvic tilts (upper thoracic - α, thoracic-lumbar - β, sacral-lumbar γ) and the angle of pelvic anteversion in the sagittal plane and the number of points scored in the sit-and-reach test in the girls involved in the study

GIRLS					
Sit-and-Reach (number)		**Angle**			**Angle of (pelvic) anteversion**
		A	**β**	**γ**	
	r	0.12	0.32	-0.08	-0.22
	Correlation power	*Poor*	***moderate***	hardly any	***poor***
	t	1.19	3.33	0.77	2.29
	Statistical significance	Lack	***α = 0.05***	lack	***α = 0.05***

When conducting the statistical analysis of the bend forward test findings (Table 12) there were noticed statistically significant correlations at the assumed level α = 0.05 with the angle of pelvic anteversion (poor correlation r = -0.22). The correlation between this test and the angle of pelvic anteversion is opposite. Moreover, there is a poor, statistically insignificant correlation with the thoracic-lumbar angle – β (r = 0.1).

Table 12

Correlations occurring between the angles characteristic of anterior-posterior pelvic tilts (upper thoracic - α, thoracic-lumbar - β, sacral-lumbar γ) and the angle of pelvic anteversion in the sagittal plane and the number of points scored in the sitting forward bend test in the girls involved in the study

GIRLS					
Sitting forward bend (cm)		**Angle**			**Angle of (pelvic) anteversion**
		A	**β**	**γ**	
	r	0.04	0.1	-0.05	-0.22
	Correlation power	hardly any	*poor*	hardly any	***poor***
	t	0.42	1.02	0.54	2.29
	Statistical significance	Lack	lack	lack	**α = 0.05**

The results of the 10 x 5m shuttle run test reveal a statistically significant correlation at the assumed level α = 0.05 with the thoracic-lumbar angle – β (poor correlation r = - 0.22, of an opposite character, i.e. the higher value of the variable the lower result of the shuttle run test). Besides, statistically insignificant correlations at the low level can be observed with the upper thoracic angle α (r= -0.14) (Table 13).

Table 13

Correlations occurring between the angles characteristic of anterior-posterior pelvic tilts (upper thoracic - α, thoracic-lumbar - β, sacral-lumbar γ) and the angle of pelvic anteversion in the sagittal plane and the number of points scored in the 10 x 5 m shuttle run test in the girls involved in the study

GIRLS					
Shuttle Run 10 x 5 (s)		**Angle**			**Angle of (pelvic) anteversion**
		A	**β**	**γ**	
	r	-0.14	-0.22	-0.01	-0.03
	Correlation power	*poor*	***poor***	hardly any	hardly any
	t	1.41	2.20	0.09	0.33
	Statistical significance	lack	***α = 0.05***	lack	lack

Besides, one low and statistically insignificant correlation (at the assumed level α = 0.05) was defined between the following tests: the standing broad jump test and the thoracic-lumbar angle - β (r = 0.22) (Table 14) as well as the handgrip test and the upper thoracic angle α (r = 0.21) (Table 15). The remaining correlations between the above mentioned tests and the step-test and the evaluated angles were at a low level and they were statistically insignificant (Table 14, 15, 16).

Table 14

Correlations occurring between the angles characteristic of anterior-posterior pelvic tilts (upper thoracic - α, thoracic-lumbar - β, sacral-lumbar γ) and the angle of pelvic anteversion in the sagittal plane and the number of points scored in the standing broad jump test in the girls involved in the study

GIRLS					
Standing Broad Jump (cm)		**Angle**			**Angle of (pelvic) anteversion**
		α	**β**	**γ**	
	R	0.16	0.22	-0.01	-0.16
	Correlation power	poor	***poor***	hardly any	poor
	T	1.63	2.30	0.06	1.58
	Statistical significance	lack	***α = 0.05***	lack	lack

Table 15

Correlations occurring between the angles characteristic of anterior-posterior pelvic tilts (upper thoracic - α, thoracic-lumbar - β, sacral-lumbar γ) and the angle of pelvic anteversion in the sagittal plane and the number of points scored in the handgrip test in the girls involved in the study

GIRLS					
Handgrip Test (KG)		**Angle**			**Angle of (pelvic) anteversion**
		α	**β**	**γ**	
	R	0.21	0.15	0.09	-0.04
	Correlation power	***poor***	poor	hardly any	hardly any
	T	2.15	1.46	0.9	0.4
	Statistical significance	***α = 0.05***	lack	lack	lack

Table 16

Correlations occurring between the angles characteristic of anterior-posterior pelvic tilts (upper thoracic - α, thoracic-lumbar - β, sacral-lumbar γ) and the angle of pelvic anteversion in the sagittal plane and the number of points scored in the step test in the boys involved in the study

GIRLS					
Step-test (points)		**Angle**			**Angle of (pelvic) anteversion**
		α	**β**	**γ**	
	r	-0.07	0.06	0.09	0.11
	Correlation power	hardly any	hardly any	hardly any	*poor*
	t	0.68	0.61	0.93	1.1
	Statistical significance	lack	lack	lack	lack

When analyzing the correlations between the independent descriptive variable: body posture (correct and incorrect) and the EUROFIT physical fitness tests, the step-test and the reaction of the circulatory system in the fifth minute of an exercise and after one-minute rest in the studied boys and girls from selected rural schools of the Kuyavia-Pomerania Province, there was defined only one statistically significant correlation at the assumed level $\alpha = 0.05$, with the bent arm hang test ($r = 0.26$) in girls (Table 20). Other correlations both in boys and girls turned out to be statistically insignificant (Table 17, 18, 19, 20). All the correlations in both studied groups had a consistent character whereas better results were achieved in fitness tests by children with the correct body posture.

Table 17

Correlations occurring between the posture (correct and incorrect) and selected tests of the EUROFIT physical fitness test in the boys involved in the study

Type of posture (correct and incorrect)	BOYS						
		Bent Arm Hang (s)	**Sit-and-Reach (number)**	**Sitting forward bend (cm)**	**10 x 5 (s) Shuttle Run**	**Standing Broad Jump**	**Handgrip Test (KG)**
	C	0.06	0.11	0.14	0.08	0.13	0.08
	Correlation power	hardly any	poor	poor	hardly any	poor	hardly any
	χ^2	0.34	1.26	2.13	0.76	1.8	0.69
	Statistical significance	Lack	lack	lack	lack	lack	lack

Table 18

Correlations occurring between the posture (correct and incorrect) and the number of points scored in the step-test and the reaction of the circulatory system in the fifth minute of an exercise and after one-minute rest in the boys involved in the study

Type of posture (correct and incorrect)	BOYS			
		Step-test (points)	Reaction of the circulatory system	
			in the fifth minute of an exercise	after one-minute rest
	C	0.12	0.14	0.13
	Correlation power	poor	poor	Poor
	χ^2	1.54	2.21	1.89
	Statistical significance	lack	lack	Lack

Table 19

Correlations occurring between the posture (correct and incorrect) and selected tests of the EUROFIT physical fitness test in the boys involved in the study

Type of posture (correct and incorrect)	GIRLS						
		Bent Arm Hang (s)	**Sit-and-Reach (number)**	**Sitting forward bend (cm)**	**10 x 5 (s) Shuttle Run**	**Standing Broad Jump**	**Handgrip Test (KG)**
	C	0.26	0.23	0.15	0.13	0.06	0.15
	Correlation power	***low***	low	low	low	hardly any	low
	χ^2	7.08	5.53	3.45	1.66	0.36	2.22
	Statistical significance	***α = 0.05***	lack	lack	lack	Lack	lack

Table 20

Correlations occurring between the posture (correct and incorrect) and the number of points scored in the step-test and the reaction of the circulatory system in the fifth minute of an exercise and after one-minute rest in the boys involved in the study

Type of posture (correct and incorrect)	GIRLS			
		Step-test (points)	Reaction of the circulatory system	
			in the fifth minute of an exercise	after one-minute rest
	C	0.06	0.13	0.15
	Correlation power	hardly any	poor	poor
	χ^2	0.31	1.64	2.48
	Statistical significance	lack	lack	lack

Discussion

A number of researchers decide to evaluate fitness of different populations and they seek for its correlations with health [1]. Nevertheless, in the available reference books only few papers concern the formation of the fitness level of children with health disorders. Most frequently scholarly publications, when exploring the issue of faulty postures in the context of fitness, refer to children aged 10 years and older [3, 4, 10], but they refer less often to younger children at the school age. These publications concern children from towns and cities [4, 12, 13, 21, 26] more frequently than from rural areas. Since no reference material was found, the research study developed by authors analysing other age groups were referred to. The data analyses conducted by Chrzanowska and Chojnacki [4], among others, in the research of students, by Prętkiewicz-Abacjew et al. [21] in the research of children beginning school education, by Resiak [26] in the research of children at the beginning of primary school education, by Sudera et al. [28] in the research of children in pre-school age, by Cieszkowski et al. [5] in the research of children aged 7-10 years. The observed persons with incorrect body postures in the research conducted by Chrzanowska and Chojnacki [4] revealed worse endurance and agility, in the research by Prętkiewicz-Abacjew et al. [21] and Resiak [26] – flexibility of the spine, trunk muscle strength, explosive strength of lower limbs and endurance, in the research by Cieszkowski et al. [5] – jumping ability, shoulder muscle strength and shoulder girdle strength and endurance, but they revealed better flexibility. The above presented results of other authors, like in own research, reveal a significant influence of body posture on fitness of children and teenagers.

Conclusions

To summarise the correlations between the characteristics of body posture and motor skills and the reaction of the circulatory system in the sagittal plane in the studied children, the following can be stated:

- ✓ As far as boys are concerned, the factors which most frequently reveal a statistically significant correlation with the studied fitness parameters, at the assumed level $\alpha = 0.05$m, include: the lumbar-sacral angle (the sit-and-reach and 10 x 5 shuttle run tests),
- ✓ Such independent variables as the upper thoracic angle and the thoracic-lumbar angle correlated with the results of only one of the fitness tests (in both cases this was the bent arm hang test),
- ✓ The remaining parameters of body posture did not reveal statistically significant correlations with any of the conducted tests intended to evaluate fitness of the studied boys,
- ✓ As far as girls are concerned, the factors which most frequently correlate with the studied fitness parameters are: the thoracic-lumbar angle (tests: sit-and-reach, 10 x 5 shuttle run and standing broad jump) and the angle of pelvic anteversion (tests: sit-and-reach and sitting forward bend),
- ✓ The independent variables like the correct posture and the upper thoracic angle correlated with the results of only one of the fitness tests (the first one with the handgrip test whereas the second one with the step-test),
- ✓ The remaining posture indexes did not reveal any statistically significant correlations with any of the conducted tests intended to evaluate the fitness level of the children involved in the study.

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