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Zmienne postawy ciała w płaszczyźnie strzałkowej u dzieci ze skoliozą i postawą skoliotyczną

Variables posture in the sagittal plane in children attitude with scoliosis and idiopathic scoliosis

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Abstrakt

Celem badań była analiza strzałkowych krzywizn kręgosłupa u dzieci ze skoliozą i postawą skoliotyczną i z normą. Kształt kręgosłupa został oceniony metodą optoelektroniczną Diers

formetric III 4D. The research was carried out in the Posturology Laboratory at the Faculty of Medicine and Health Sciences, UJK in Kielce (Poland). Największe bezwzględne zróżnicowanie wartości badanych zmiennych u dziewcząt i chłopców z grupy skolioz, postaw skoliotycznych i z normą zaobserwowano dla długości tułowia VP-SP (mm). Jednoczynnikowa analiza wariancji wykazała istotne różnice wewnątrzgrupowe w pomiarach kąta lordozy zarówno wśród dziewcząt jak i chłopców. Oznacza to, że tylko wartości kątów lordozy różniły się istotnie między grupami skolioz, postaw skoliotycznych i w normie. Zarówno u dziewcząt jak i u chłopców kąt lordozy w grupie skolioz był znacząco niższy niż w grupie postaw skolitycznych i grupie z normą. U dzieci ze skoliozą doszło w pierwszej kolejności do spłycenia lordozy lędźwiowej kręgosłupa. Wielkość fizjologicznej kifozy piersiowej i lordozy lędźwiowej należy uwzględnić w doborze metod leczenia skolioz. W leczeniu skolioz należy stosować wzorce łopatki i miednicy, przywracające prawidłowy zakres kifozy piersiowej i lordozy lędźwiowej.

Słowa kluczowe: zmienne postawy ciała w płaszczyźnie strzałkowej, skolioza, postawa skoliotyczna, Diers formetric III 4D

Abstract

The aim of the study was to analyze the sagittal spinal curvatures in children with scoliosis and idiopathic scoliosis attitude and norm. The shape of the spine was assessed using optoelectronic Diers formetric III 4D. The research was Carried out in the Posturology Laboratory at the Faculty of Medicine and Health Sciences, UJK in Kielce (Poland). The biggest differences in the absolute values of the variables tested in girls and boys with a group of scoliosis, attitudes and scoliotic standard body length was observed for SP-VP (mm). Univariate analysis of variance showed significant differences in the measurement of intra-lordosis angle among both boys and girls. This means that only the angles of lordosis differed significantly between the groups scoliosis, attitudes and scoliotic standard. Both girls and boys lordosis angle of scoliosis in the group was significantly lower than in the attitudes scolitic group and with the standard. In children with scoliosis it occurred in the first place to shallow lumbar lordosis. The size of the physiological thoracic kyphosis and lumbar lordosis should be taken into account in the selection of methods of treatment of scoliosis. In the treatment of scoliosis, use patterns shoulders and the pelvis, to restore the normal range thoracic kyphosis and lumbar lordosis.

Key words: variable posture in the sagittal plane; scoliosis; idiopathic scoliosis attitude; Diers formetric III 4D

Introduction

Idiopathic scoliosis is a developmental deformity of the spine and trunk. Character is three-dimensional deformation. In the coronal plane bending occurs lateral spine in the sagittal plane physiological disorder thoracic kyphosis and lumbar lordosis, and the transverse axial

rotation of vertebrae. Deformation is developing simultaneously in all three planes and vomiting is called the spine [1-4]. It is generally believed that children with scoliosis occurs in the first place to shallow curvatures of the spine in the sagittal plane [5-10]. Changes in physiological curvature are unfavorable and lead to an overload of intervertebral discs and articular teenagers. Therefore, the goal of therapy of scoliosis should be to restore normal relations between the vertebrae so that the distribution of pressing forces and shear burdened vertebral bodies, not articular processes [11-15]. Passive stabilizing structure, such as intervertebral discs, bags facet joints, ligaments, they are not able to provide adequate fixation of segmental sagittal [16-18]. Muscular dystonia, which occurs in children with scoliosis, a destabilizing effect and additional burden these structures. It was not until the introduction of forces neuromuscular origin brings a reduction in displacement in the sagittal plane [19]. The aim of the study was to analyze the sagittal spinal curvatures in children with scoliosis and idiopathic scoliosis attitude of the norm. what occurs in children with scoliosis, a destabilizing effect and additional burden on these structures. It was not until the introduction of forces neuromuscular origin brings a reduction in displacement in the sagittal plane [19]. The aim of the study was to analyze the sagittal spinal curvatures in children with scoliosis and idiopathic scoliosis attitude of the norm. what occurs in children with scoliosis, a destabilizing effect and additional burden on these structures. It was not until the introduction of forces neuromuscular origin brings a reduction in displacement in the sagittal plane [19]. The aim of the study was to analyze the sagittal spinal curvatures in children with scoliosis and idiopathic scoliosis attitude of the norm.

Material and Methods

The study included children aged 7 and 8 years, with a primary school Holy Cross (Poland). The study involved 251 children, including 113 girls (45.02%) and 138 boys (54.98%). Numerous group were children at the age of seven, of which there were 130 (51.79%) of all respondents. Among them were 63 (48.46%) and 67 girls (51.54%) boys. Children eight years there were 121 (48.21%) of the total. In this age girls were 50 (41.32%), while 71 boys (58.68%). The selection of respondents was mixed, after having established the criteria to be met by each group. The study was conducted in 2017 in Posturology Laboratory, Faculty of Medicine and Health Sciences UJK in Kielce. The guardians of the children were informed about the purpose of the study and Expressed Their written consent for children's participation in the study. The study was non-invasive and free of charge. The patients willingly participated in the study, and Perceived it as a concern about Their state of health. Body height tested was determined using a tape centimeter accuracy of 1 cm. Body weight and BMI were calculated using a body composition analyzer TANITA MC 780M. The shape of the

spine was assessed using optoelectronic Diers formetric III 4D. Photogrammetric method allows the video recording back surface using stereographic process raster. On the basis of the data was created precise, three-dimensional model of the spine. Taking into account the anatomical and biomechanical assumptions of the model, it was possible to calculate the fixed points anatomical curves of the spine and torso forms of spatial parameters. Method Diers formetric III 4D is non-contact and, above all nonbeam way to measure body posture. The room where the measurement was performed posture was dimmed so that the sun's rays not fall directly on the body. The test was stripped to shorts back before a device consisting of a digital video camera and projector. The projector emits parallel measurement lines on the back surface, and a digital video camera three-dimensional image conveyed to the computer. The study was conducted in the dicam by measuring Average, consisting in the execution sequence of twelve pictures, which by creating the average value of the variances reduced the attitudes and thereby improve the value of clinical research. According to the manufacturer the camera Diers formetric III 4D presence of scoliosis and attitudes scoliotic was observed by considering the values of three parameters: the pelvic obliquity (mm) lateral deviation (mm) and a surface of rotation (°). Idiopathic scoliosis attitude skew occurred when the pan is less than or equal to 5 mm, lateral deviation was less than or equal to 5 mm and a surface of rotation is less than or equal to 5 degrees. In contrast, when the skewness occurred scoliosis pelvis was greater than 5 mm, lateral deviation was larger than 5 mm, and the rotation surface is greater than 5 degrees. To assess the incidence of idiopathic scoliosis or scoliosis posture all three conditions had to be met. Rules based on the size of the angle of kyphosis and lordosis angle isolated lumbar spine 9 types: lateral deviation was larger than 5 mm, and the rotation surface is greater than 5 degrees. To assess the incidence of idiopathic scoliosis or scoliosis posture all three conditions had to be met. Rules based on the size of the angle of kyphosis and lordosis angle isolated lumbar spine 9 types: lateral deviation was larger than 5 mm, and the rotation surface is greater than 5 degrees. To assess the incidence of idiopathic scoliosis or scoliosis posture all three conditions had to be met. Rules based on the size of the angle of kyphosis and lordosis angle isolated lumbar spine 9 types:

backbone with normal physiological curves: the angle of kyphosis: 42 ° -55 °; lumbar lordosis angle of 33 ° -47 °;

less kyphosis and lordosis reduced: the angle of kyphosis <42 °; lumbar lordosis angle <33 °;

less correct kyphosis and lordosis: angle of kyphosis <42 °; lumbar lordosis angle of 33-47 °;

reduced kyphosis and lordosis, plus: angle of kyphosis <42 °; lumbar lordosis angle> 47 °;

correct kyphosis and lordosis, plus: angle of kyphosis: 42 ° -55 °; lumbar lordosis angle> 47 °;

increased kyphosis and lordosis reduced: the angle of kyphosis: > 55 °; lumbar lordosis angle <33 °;

plus correct kyphosis and lordosis: angle of kyphosis: > 55 °; lumbar lordosis angle of 33 ° -47 °;

increased kyphosis and lordosis, plus: angle of kyphosis: > 55 °; lumbar lordosis angle of> 47 °.

correct kyphosis, lordosis reduced: the angle of kyphosis: 42 ° -55 °; lumbar lordosis angle <33 °.

Reliability The results of the analysis of posture using Diers formetric III 4D has been confirmed by comparison with approximately 500 digital and businesslike - numerically compare and contrast X-rays [20]. Before starting the calculation performed Kolmogorov-Smirnov test to determine the normality of distribution. To assess whether the variables posture in the sagittal plane, differ significantly between gender and age category in groups scoliosis, attitudes scoliotic and standard as well as whether the level between the two groups differ significantly among girls and boys, and 7-year-olds and 8 -year-olds used one-way ANOVA.

Results

The test spine by Diers formetric III 4D shown in 103 (41%) children scoliosis. Attitude idiopathic scoliosis diagnosed in 141 (56.17%) children. With the proper attitude was only 7 (3.0%) children. Value measurement location and dispersion variables posture in the sagittal plane have different distributions of variables in girls and boys, as well as LVL 7 and 8 year olds in groups of attitudes scoliotic, scoliosis and normal. The greatest differences in absolute value in girls from scoliosis occurred for the length of the body-VP SP [mm] (S = 40.32), similarly in the group of posture in idiopathic scoliosis (S = 32.74) and standard (S = 41.44) (tab. 1). In boys group scoliosis also observed differences in the largest absolute value to the variable length of the body VP-SP (mm) [%] (S = 59.21) and in the attitudes scoliotic group (S = 30 07) and the standard (S = 20.82) (Tab. 2). The largest absolute differences in the values of 7 and 8 year olds from scoliosis occurred for a variable length of the body VP-SP [mm], the same for a group of the attitude of idiopathic scoliosis, in the group with the standard variable angle of lordosis ITL-ILS (max.) [°] (tab. 5). One-way analysis of variance showed significant differences in intra-lumbar lordosis angle measurements of females (F =

4.69; p = 0.01) and boys (F = 4.03; p = 0.02) (Tab. 5). This means that only the lordosis angles differ significantly between the groups attitudes scoliotic, scoliosis and normal girls and boys, and the value of the significance level was less than 0.5 ($p < 0.05$). Both girls and boys, an angle of lordosis in scoliosis group was significantly lower than in the attitudes scolitic group and with the standard. One-way analysis of variance showed significant differences in the measurement of intra-lordosis angle of 7 year old (F = 5.50; p = 0.01), which means that these values were significantly different between groups attitudes scoliotic, scoliosis and normal, and the value of the level of significance was less than 0.5 ($p < 0.05$). Among the 8 year old significant differences in intragroup variables posture in the sagittal plane was not (Tab. 5). The most common type of spinal wide group of patients was reduced kyphosis and lordosis correct (Reduced kyphosis, correct lordosis) (22%). Among the most frequent correct scoliosis and kyphosis reduced lordosis (Correct kyphosis, lordosis reduced) (23%) and reduced normal kyphosis and lordosis (23%) (Reduced kyphosis, correct lordosis) (23%). Among the most often attitudes scoliotic less correct kyphosis and lordosis (Reduced kyphosis, correct lordosis) (21%) and decreased the kyphosis and lordosis, plus (Reduced kyphosis and lordosis Increased) (21%). In the group of normal behavior was observed most frequently correct lordosis, kyphosis and normal (Correct kyphosis, correct lordosis (29%) and decreased the kyphosis and lordosis, plus (Reduced kyphosis and lordosis Increased) (29%) (Tab. 6).

Discussion

Prominent experts on scoliosis Sommerville [21, 22] made [23], Schulthess, [24] Schede [25] Lindemann [26] are of the opinion that the flat back is the starting point or predisposing factor for scoliosis. According to Bradford [27] scoliosis is a combination of a back plane and laterally warped. Computer tomographic studies on the preparation of scoliosis conducted by Deane and Duthie [28] showed that the dorsal vertebral arches government set is shorter, compared with a row of vertebrae, which proves the original flattened thoracic kyphosis of the spine. Roaf [29] Dickson [30] and Zielke [31] believe that the causes of scoliosis should look for in a flattened thoracic kyphosis. The physiological bends of anterior-posterior body weight rests on relatively large surfaces of the vertebral bodies, which are protected by the intervertebral discs of the shock-absorbing properties. Flattening of the thoracic kyphosis and lumbar lordosis while causing partial or complete transfer of loads associated with the vertical posture on the small, rigid, obliquely or even vertically positioned articular processes, which makes the system less stable. Schede [32] noted that flattening of the back spine makes labile and prone to lateral deflection. Properly shaped curvature of the spine physiological protect him from the creation of the lateral curvatures [33-35]. Flattening of thoracic kyphosis and lumbar lordosis is rightly considered to be

predisposing factors for progressive idiopathic scoliosis. The size of the physiological thoracic kyphosis and lumbar lordosis should be taken into account in the selection of methods of treatment of scoliosis. For example, in a preferred method, kinesitherapy PNF (ang. Proprioceptive neuromuscular facilitation) should be used, the blade movement patterns depending on the location and direction of curvature, or that result in elevation of the shoulder and deepening or flattening of the thoracic kyphosis. Proper selected patterns of the pelvis, in turn, cause a reduction or lifting the hips and deepening or shallowing of lumbar lordosis. In the treatment of scoliosis, use patterns shoulders and the pelvis, to restore the normal range of the two curvatures of the spine. [36]

Conclusions

The aim of the study was to analyze the sagittal spinal curvatures in children with scoliosis and idiopathic scoliosis attitude. The shape of the spine was assessed using optoelectronic Diers formetric III 4D. The research was Carried out in the Posturology Laboratory at the Faculty of Medicine and Health Sciences, UJK in Kielce (Poland). The biggest differences in the absolute values of the variables tested in girls and boys with a group of scoliosis, attitudes and scoliotic standard body length was observed for SP-VP (mm). Univariate analysis of variance showed significant differences in the measurement of intra-lordosis angle among both boys and girls. This means that only the angles of lordosis differed significantly between the groups scoliosis, attitudes and scoliotic standard. Both girls and boys lordosis angle of scoliosis in the group was significantly lower than in the attitudes scolitic group and with the standard. In children with scoliosis it occurred in the first place to shallow lumbar lordosis. The size of the physiological thoracic kyphosis and lumbar lordosis should be taken into account in the selection of methods of treatment of scoliosis. In the treatment of scoliosis, use patterns shoulders and the pelvis, to restore the normal range thoracic kyphosis and lumbar lordosis.

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Table 1. Distribution of posture variables in the sagittal plane in girls

Distribution of posture variables in the sagittal plane in girls with scoliosis						
Variable	Average	Confidence interval		Minimum	Maximum	Standard deviation
		-95,00%	95,00%			
Angle of kyphosis ICT-ITL(maks.) [°]	43,97	40,81	47,14	19,00	71,00	9,76
Angle of lordosis ITL-ILS (maks.) [°]	45,41	41,71	49,11	14,00	69,00	11,41
Torso length VP-DM [mm]	324,23	312,84	335,62	254,00	400,00	35,13
Torso length VP-SP [mm]	377,59	364,52	390,66	308,00	460,00	40,32
Distribution of posture variables in the sagittal plane in girls with a scoliotic posture						
Variable	Average	Confidence interval		Minimum	Maximum	Standard deviation
		-95,00%	95,00%			
Angle of kyphosis ICT-ITL(maks.) [°]	41,07	39,05	43,09	15,00	61,00	8,47
Angle of lordosis ITL-ILS (maks.) [°]	43,46	40,49	46,42	19,00	76,00	12,43
Torso length VP-DM [mm]	317,17	310,66	323,68	233,00	413,00	27,30
Torso length VP-SP [mm]	369,01	361,21	376,82	303,00	464,00	32,74
Distribution of postural variables in the sagittal plane in girls with the norm						
Variable	Average	Confidence interval		Minimum	Maximum	Standard deviation
		-95,00%	95,00%			
Angle of kyphosis ICT-ITL(maks.) [°]	43,25	37,68	48,82	39,00	47,00	3,50
Angle of lordosis ITL-ILS (maks.) [°]	62,25	45,59	78,91	52,00	74,00	10,47
Torso length VP-DM [mm]	313,25	266,92	359,58	283,00	342,00	29,11
Torso length VP-SP [mm]	372,25	306,32	438,18	334,00	425,00	41,44

Table 2. Distribution of postural variables in the sagittal plane in boys

Distribution of postural variables in the sagittal plane in boys with scoliosis						
Variable	Average	Confidence interval		Minimum	Maximum	Standard deviation
		-95,00%	95,00%			
Angle of kyphosis ICT-ITL(maks.) [°]	41,91	38,86	44,95	3,00	69,00	12,18
Angle of lordosis ITL-ILS (maks.) [°]	33,38	30,13	36,62	9,00	67,00	13,00
Torso length VP-DM [mm]	325,41	316,07	334,75	262,00	511,00	37,39
Torso length VP-SP [mm]	380,03	365,24	394,82	316,00	746,00	59,21
Distribution of postural variables in the sagittal plane in boys with a scoliotic posture						
Variable	Average	Confidence interval		Minimum	Maximum	Standard deviation
		-95,00%	95,00%			
Angle of kyphosis ICT-ITL(maks.) [°]	42,23	40,38	44,07	21,00	60,00	7,78
Angle of lordosis ITL-ILS (maks.) [°]	38,94	36,14	41,75	18,00	78,00	11,84
Torso length VP-DM [mm]	324,54	318,17	330,90	248,00	384,00	26,90
Torso length VP-SP [mm]	375,59	368,47	382,71	305,00	490,00	30,07
Distribution of postural variables in the sagittal plane in boys with the norm						
Variable	Average	Confidence interval		Minimum	Maximum	Standard deviation
		-95,00%	95,00%			
Angle of kyphosis ICT-ITL(maks.) [°]	42,67	18,80	66,54	34,00	53,00	9,61
Angle of lordosis ITL-ILS (maks.) [°]	44,33	21,25	67,41	38,00	55,00	9,29
Torso length VP-DM [mm]	309,67	262,71	356,63	295,00	331,00	18,90
Torso length VP-SP [mm]	360,67	308,96	412,38	344,00	384,00	20,82

Table 3. Distribution of posture variables in the sagittal plane in 7 year olds

Distribution of sagittal plane variables in 7-year-olds with scoliosis						
Variable	Average	Confidence interval		Minimum	Maximum	Standard deviation
		-95,00%	95,00%			
Angle of kyphosis ICT-ITL(maks.) [°]	42,38	39,22	45,55	16,00	71,00	11,37
Angle of lordosis ITL-ILS (maks.) [°]	35,17	31,83	38,52	13,00	67,00	12,02
Torso length VP-DM [mm]	310,83	302,98	318,68	254,00	400,00	28,19
Torso length VP-SP [mm]	361,58	353,10	370,05	308,00	451,00	30,44
Distribution of sagittal plane variables in 7-year-olds with a scoliotic posture						
Variable	Average	Confidence interval		Minimum	Maximum	Standard deviation
		-95,00%	95,00%			
Angle of kyphosis ICT-ITL(maks.) [°]	41,38	39,54	43,22	15,00	61,00	8,05
Angle of lordosis ITL-ILS (maks.) [°]	41,37	38,34	44,40	18,00	78,00	13,27
Torso length VP-DM [mm]	312,20	306,23	318,16	248,00	413,00	26,11
Torso length VP-SP [mm]	360,61	354,34	366,87	304,00	463,00	27,40
Distribution of sagittal plane variables in 7-year-olds with the norm						
Variable	Average	Confidence interval		Minimum	Maximum	Standard deviation
		-95,00%	95,00%			
Angle of kyphosis ICT-ITL(maks.) [°]	40,00	27,29	52,71	39,00	41,00	1,41
Angle of lordosis ITL-ILS (maks.) [°]	57,00	-159,01	273,01	40,00	74,00	24,04
Torso length VP-DM [mm]	293,00	165,94	420,06	283,00	303,00	14,14
Torso length VP-SP [mm]	344,00	216,94	471,06	334,00	354,00	14,14

Table 4. Distribution of posture variables in the sagittal plane in 8 year olds

Distribution of sagittal plane variables in 8-year-olds with scoliosis						
Variable	Average	Confidence interval		Minimum	Maximum	Standard deviation
		-95,00%	95,00%			
Angle of kyphosis ICT-ITL(maks.) [°]	43,00	39,80	46,20	3,00	69,00	11,38
Angle of lordosis ITL-ILS (maks.) [°]	40,75	36,59	44,90	9,00	69,00	14,79
Torso length VP-DM [mm]	339,37	328,59	350,16	270,00	511,00	38,34
Torso length VP-SP [mm]	396,98	379,05	414,91	334,00	746,00	63,76
Distribution of sagittal plane variables in 8-year-olds with a scoliotic posture						
Variable	Average	Confidence interval		Minimum	Maximum	Standard deviation
		-95,00%	95,00%			
Angle of kyphosis ICT-ITL(maks.) [°]	41,97	39,92	44,02	20,00	60,00	8,26
Angle of lordosis ITL-ILS (maks.) [°]	40,97	38,20	43,73	25,00	74,00	11,16
Torso length VP-DM [mm]	331,03	324,80	337,26	233,00	384,00	25,13
Torso length VP-SP [mm]	386,03	378,46	393,61	303,00	490,00	30,57
Distribution of sagittal plane variables in 8-year-olds with the norm						
Variable	Average	Confidence interval		Minimum	Maximum	Standard deviation
		-95,00%	95,00%			
Angle of kyphosis ICT-ITL(maks.) [°]	44,20	35,54	52,87	34,00	53,00	6,98
Angle of lordosis ITL-ILS (maks.) [°]	53,60	40,33	66,87	38,00	68,00	10,69
Torso length VP-DM [mm]	319,20	290,76	347,64	294,00	342,00	22,91
Torso length VP-SP [mm]	376,60	334,82	418,38	344,00	425,00	33,65

Table 5. Variable posture in the sagittal plane and analysis of ANOVA differences

Variable posture in the sagittal plane in girls				
Variable	Scoliosis	Scoliotic posture	Correct posture	ANOVA (F; p)
	Average	Average	Average	
Angle of kyphosis ICT-ITL(maks.) [°]	43,97	41,07	43,25	F=1,38; p=0,26
Angle of lordosis ITL-ILS (maks.) [°]	45,41	43,46	62,25	**F=4,69; p=0,01**
Torso length VP-DM [mm]	324,23	317,17	313,25	F=0,77; p=0,47
Torso length VP-SP [mm]	377,59	369,01	372,25	F=0,72; p=0,49
Variable posture in the sagittal plane in boys				
Variable	Scoliosis	Scoliotic posture	Correct posture	ANOVA (F; p)
	Average	Average	Average	
Angle of kyphosis ICT-ITL(maks.) [°]	41,91	42,23	42,67	F=0,02; p=0,98
Angle of lordosis ITL-ILS (maks.) [°]	33,38	38,94	44,33	**F=4,03; p=0,02**
Torso length VP-DM [mm]	325,41	324,54	309,67	F=0,34; p=0,71
Torso length VP-SP [mm]	380,03	375,59	360,67	F=0,36; p=0,70
Variable posture in the sagittal plane of 7 year olds				
Variable	Scoliosis	Scoliotic posture	Correct posture	ANOVA (F; p)
	Average	Average	Average	
Angle of kyphosis ICT-ITL(maks.) [°]	42,38	41,38	40,00	F=0,21; p=0,81
Angle of lordosis ITL-ILS (maks.) [°]	35,17	41,37	57,00	**F=5,50; p=0,01**
Torso length VP-DM [mm]	310,83	312,20	293,00	F=0,51; p=0,60
Torso length VP-SP [mm]	361,58	360,61	344,00	F=0,37; p=0,69
Variable posture in the sagittal plane in 8-year-olds				
Variable	Scoliosis	Scoliotic posture	Correct posture	ANOVA (F; p)
	Average	Average	Average	
Angle of kyphosis ICT-ITL(maks.) [°]	43,00	41,97	44,20	F=0,24; p=0,78
Angle of lordosis ITL-ILS (maks.) [°]	40,75	40,97	53,60	F=2,37; p=0,10
Torso length VP-DM [mm]	339,37	331,03	319,20	F=1,60; p=0,21
Torso length VP-SP [mm]	396,98	386,03	376,60	F=0,97; p=0,38

Variable posture in the sagittal plane in girls				
Variable	Scoliosis	Scoliotic posture	Correct posture	ANOVA (F; p)
	Average	Average	Average	
Angle of kyphosis ICT-ITL(maks.) [°]	43,97	41,07	43,25	F=1,38; p=0,26
Angle of lordosis ITL-ILS (maks.) [°]	45,41	43,46	62,25	**F=4,69; p=0,01**
Torso length VP-DM [mm]	324,23	317,17	313,25	F=0,77; p=0,47
Torso length VP-SP [mm]	377,59	369,01	372,25	F=0,72; p=0,49
Variable posture in the sagittal plane in boys				
Variable	Scoliosis	Scoliotic posture	Correct posture	ANOVA (F; p)
	Average	Average	Average	
Angle of kyphosis ICT-ITL(maks.) [°]	41,91	42,23	42,67	F=0,02; p=0,98
Angle of lordosis ITL-ILS (maks.) [°]	33,38	38,94	44,33	**F=4,03; p=0,02**
Torso length VP-DM [mm]	325,41	324,54	309,67	F=0,34; p=0,71
Torso length VP-SP [mm]	380,03	375,59	360,67	F=0,36; p=0,70
Variable posture in the sagittal plane of 7 year olds				
Variable	Scoliosis	Scoliotic posture	Correct posture	ANOVA (F; p)
	Average	Average	Average	
Angle of kyphosis ICT-ITL(maks.) [°]	42,38	41,38	40,00	F=0,21; p=0,81
Angle of lordosis ITL-ILS (maks.) [°]	35,17	41,37	57,00	**F=5,50; p=0,01**
Torso length VP-DM [mm]	310,83	312,20	293,00	F=0,51; p=0,60
Torso length VP-SP [mm]	361,58	360,61	344,00	F=0,37; p=0,69
Variable posture in the sagittal plane in 8-year-olds				
Variable	Scoliosis	Scoliotic posture	Correct posture	ANOVA (F; p)
	Average	Average	Average	
Angle of kyphosis ICT-ITL(maks.) [°]	43,00	41,97	44,20	F=0,24; p=0,78
Angle of lordosis ITL-ILS (maks.) [°]	40,75	40,97	53,60	F=2,37; p=0,10
Torso length VP-DM [mm]	339,37	331,03	319,20	F=1,60; p=0,21
Torso length VP-SP [mm]	396,98	386,03	376,60	F=0,97; p=0,38

Variable posture in the sagittal plane in girls				
Variable	Scoliosis	Scoliotic posture	Correct posture	ANOVA (F; p)
	Average	Average	Average	
Angle of kyphosis ICT-ITL(maks.) [°]	43,97	41,07	43,25	F=1,38; p=0,26
Angle of lordosis ITL-ILS (maks.) [°]	45,41	43,46	62,25	**F=4,69; p=0,01**
Torso length VP-DM [mm]	324,23	317,17	313,25	F=0,77; p=0,47
Torso length VP-SP [mm]	377,59	369,01	372,25	F=0,72; p=0,49
Variable posture in the sagittal plane in boys				
Variable	Scoliosis	Scoliotic posture	Correct posture	ANOVA (F; p)
	Average	Average	Average	
Angle of kyphosis ICT-ITL(maks.) [°]	41,91	42,23	42,67	F=0,02; p=0,98
Angle of lordosis ITL-ILS (maks.) [°]	33,38	38,94	44,33	**F=4,03; p=0,02**
Torso length VP-DM [mm]	325,41	324,54	309,67	F=0,34; p=0,71
Torso length VP-SP [mm]	380,03	375,59	360,67	F=0,36; p=0,70
Variable posture in the sagittal plane of 7 year olds				
Variable	Scoliosis	Scoliotic posture	Correct posture	ANOVA (F; p)
	Average	Average	Average	
Angle of kyphosis ICT-ITL(maks.) [°]	42,38	41,38	40,00	F=0,21; p=0,81
Angle of lordosis ITL-ILS (maks.) [°]	35,17	41,37	57,00	**F=5,50; p=0,01**
Torso length VP-DM [mm]	310,83	312,20	293,00	F=0,51; p=0,60
Torso length VP-SP [mm]	361,58	360,61	344,00	F=0,37; p=0,69
Variable posture in the sagittal plane in 8-year-olds				
Variable	Scoliosis	Scoliotic posture	Correct posture	ANOVA (F; p)
	Average	Average	Average	
Angle of kyphosis ICT-ITL(maks.) [°]	43,00	41,97	44,20	F=0,24; p=0,78
Angle of lordosis ITL-ILS (maks.) [°]	40,75	40,97	53,60	F=2,37; p=0,10
Torso length VP-DM [mm]	339,37	331,03	319,20	F=1,60; p=0,21
Torso length VP-SP [mm]	396,98	386,03	376,60	F=0,97; p=0,38

Table 6. Types of posture

Types of posture	Total	Scoliosis	Scoliotic posture	Correct posture
Reduced kyphosis, correct lordosis	**54 (22%)**	**24 (23%)**	**29 (21%)**	1 (14%)
Reduced kyphosis and increased lordosis	**44 (18%)**	13 (13%)	**29 (21%)**	**2 (29%)**
Reduced kyphosis and reduced lordosis	15 (6%)	7 (7%)	8 (6%)	-
Correct kyphosis, reduced lordosis	**51 (20%)**	**24 (23%)**	**26 (18%)**	1 (14%)
Correct kyphosis, enlarged lordosis	24 (10%)	7 (14%)	16 (11%)	1 (14%)
Correct kyphosis, correct lordosis	**44 (18%)**	14 (14%)	**28 (20%)**	**2 (29%)**
Increased kyphosis, correct lordosis	10 (4%)	6 (6%)	4 (3%)	-
Increased kyphosis, correct lordosis	6 (2%)	5 (5%)	1 (1%)	-
Increased kyphosis and increased lordosis	3 (1%)	3 (3%)	-	-