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SEMG amplitude of the erector spinae in children with scoliotic lesions

Jacek Wilczyński[1], Przemysław Karolak[2], Sylwia Janecka[2], Magdalena Kabała[2], Natalia Habik-Tatarowska[2], Żaneta Wypych[3]

1. **Department Posturology, Hearing and Balance Rehabilitation, Institute of Physiotherapy, Faculty of Medicine and Health Sciences, Jan Kochanowski University in Kielce, Poland;**
2. **Ph.D. student, Institute of Physiotherapy, Faculty of Medicine and Health Sciences, Jan Kochanowski University in Kielce, Poland;**
3. **student, Institute of Physiotherapy, Faculty of Medicine and Health Sciences, Jan Kochanowski University in Kielce, Poland.**

Corresponding author:
Assoc. Prof. UJK, Ph.D. Jacek Wilczyński, Head of Posturology Department, Hearing and Balance Rehabilitation, Faculty of Medicine and Health Sciences, Jan Kochanowski University, Kielce, Al. IX Wieków Kielc 19, 25-317 Kielce, Poland, Phone: 0048 603-703-926, e-mail: jwilczyński@onet.pl, www.jacekwilczynski.com.pl

Abstrakt

Celem badań była analiza amplitudy SEMG prostownika grzbietu u dzieci ze zmianami skoliotycznymi. Amplitudę SEMG prostownika grzbietu badano aparatem Noraxon TeleMyo DTS. Kształt kręgosłupa został ocenionyo 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). W grupie dzieci ze skoliozą najczęściej występowało skrzywienie o lokalizacji piersiowej. U dziewcząt stanowiło ono (62%), u chłopców (56%). Jednoczynnikowa analiza wariancji wykazała istotne różnice

wewnątrzgrupowe wśród chłopców w pomiarach amplitudy SEMG dla zmiennej kończyny dolne w górę odcinek lędźwiowy lewa strona. Oznacza to, że wartości rozkładu amplitudy SEMG prostownika grzbietu w badaniu kończyny dolne w górę odcinek lędźwiowy lewa strona różniły się istotnie między grupami postaw skoliotycznych, skolioz i normie. Amplituda SEMG prostownika grzbietu w badaniu kończyny dolne w górę odcinek lędźwiowy lewa strona była najniższa w grupie skolioz. W związku z tym, że w grupie chłopców ze skoliozą dominował lewostronny kierunek skrzywienia w odcinku lędźwiowym, można stwierdzić, że większa amplituda SEMG prostownika grzbietu występowała po wklęsłej stronie skrzywienia lędźwiowego kręgosłupa.

Słowa kluczowe: amplituda SEMG prostownika grzbietu, skolioza, postawa skoliotyczna, Noraxon TeleMyo DTS, Diers formetric III 4D

Abstract

The aim of the study was to analyze the amplitude of SEMG rectifier spine in children with scoliotic changes. SEMG amplitude rectifier back of the camera has been studied Noraxon TeleMyo DTS. The shape of the spine was estimated optoelectronic method 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). In the group of children with scoliosis curvature of the most frequently occurred on the location of the rib. In girls, it represented (62%) in boys (56%). Univariate analysis of variance showed significant differences among boys in intra-amplitude measurements SEMG variable lower limbs up the left side of the lumbar. Means, that the value of the amplitude distribution SEMG rectifier ridge in the study of lower limbs up the left side of the lumbar differed significantly between the groups scoliotic attitudes, scoliosis and normal. The amplitude of SEMG rectifier ridge in the study of lower limbs up the lumbar left was the lowest in the group of scoliosis. Due to the fact that a group of boys with scoliosis had most of the left-hand direction of curvature in the lumbar region, we can conclude that the greater the amplitude of SEMG rectifier occurred at the back of the concave side of the curvature of the lumbar spine.

Key words: amplitude SEMG rectifier dorsal scoliosis posture in idiopathic scoliosis, Noraxon TeleMyo DTS Diers formetric III 4D

Introduction

Scoliosis is a biological consequence of changes in the central nervous system [1]. This unsightly and sometimes even catastrophic disease, reducing the efficiency and capacity of the body is mechanically and biologically reasoned the response to changes in the CNS [2-4]. Mechanical perception of the role of back muscles to treat scoliosis without linking the functions of the CNS causes unwarranted focus on the formation of the so-called. muscular corset. More specifically the classes shaping muscle strength and endurance postural [5]. This element of that procedure is, of course, important, but the approach to the functioning of these muscles must be completely different. There is enough evidence to show that, despite the significant strength and endurance of postural muscles often abnormal posture is assumed, even develop scoliosis. The etiopathogenic meaning of scoliosis is only a symptom, the external expression of unrecognized pathology, which can appear anywhere spine and age of the child. Although scoliosis is clearly a distortion of the spine and posture, it is at the same time it is a result of the ability of the compensation body, allowing you to set the behavior of the head and shoulder girdle over the pelvis [11]. The final shape of the body is the result of the deforming process and response compensation so that the body at the expense of huge disorders own form maintains the general orientation of the body. Only in-depth understanding of the pathogenesis and development of scoliosis indicate appropriate treatments. In developed scoliosis changes in muscle have a secondary nature, resulting from non-uniform axial loading of the spine. [12] Electrodiagnostic studies have not clarified whether changes in muscle tension when the convex and concave side of the curvature is primary or secondary. EMG interpretation of study results vary and is often quite the opposite. The asymmetry of the back muscle is not due to morphological changes in muscle but is formed under the effect of a change of stimuli in the CNS [13-17]. The aim of the study was to analyze the amplitude of SEMG rectifier spine in children with scoliotic changes.

Material and Methods

The study took part children aged 7 and 8 years, with a primary school Holy Cross (Poland). They studied 251 children, including 113 girls (45.02%) and 138 boys (54.98%). We used a mixed selection for testing, by appointment criteria to be met by each group. The study was performed in 2017 in Posturologii Laboratory, Faculty of Medicine and Health Sciences UJK in Kielce. All test procedures were performed according to the Helsinki declaration in force in 1964 and with the approval of the Bioethics Committee of the University of Jan Kochanowski University in Kielce (Resolution No. 5/2015). All parents gave written consent to participate in the study child. 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. Electromyography was performed p12 Noraxon TeleMyo camera channel DTS. The unit had an EC certificate (Certification Production Quality Assurance Directive 93/42 / EEC Medical Devices Annex V). The study pregelatinized applied electrodes having a diameter of 3 cm. In place of the applied with to an electrode, the skin cleaned investigated for helping and abrasive fluid. Electrodes positioned parallel to the test fibers Irtsniowych. The distanceęI pęamong them is about two centimeters. Erector spinae muscles were examined in the thoracic and lumbar, both on the left and the right on his side. Each test lasted 10 seconds. The study included an average amplitude of the voltage of the back extensor muscle expressed in microvolts (uV). On Y axis was the voltage amplitude, while the X-axis - the recording time in seconds. The test results take into account the scale of the intensity of the voltage interval that was 100 milliseconds. The study used a mode of the continuous recording track. SEMG recording was performed directly on the surface of the skin. Action potentials recorded from the rectifier spine in the thoracic and lumbar curvature curves at the top:

1. habitual in the standing position (Standard anatomical position).
2. in the rest position: lying in the front (the lower limbs straight in the knee joints, the legs extend along the upper body),

3. the isometric contraction under:

- lying in the front (the lower limbs straight in the knee joints, the legs extend along the upper torso, pelvis stabilized) test floating body within the spine mobility, and maintained it in this position for 10 seconds.

- lying in the front and the stable upper body (shoulders and chest, legs arranged as before) rises tested both lower limbs at the maximum possible height and kept for 10 s.

Were analyzed: the average amplitude of the signal, which is correlated with the degree of muscle activity, ie. with the voltage characteristics of temporal muscle work (lack of stimulation, constant activity, improper stimulation - early, late, too short, too long). SEMG study was painless and non-invasive. Measurement SEMG was in line with the recommendations of SENIAM (Surface ElectroMyoGraphy for the Non-Invasive Assessment of Muscles), a European research program containing a range of guidelines for the selection of electrode types, their location, anatomy and muscle function, muscle group tests and signal processing and equipment conditions. By means of an electromyographic examination, it was possible to show the relationship between muscle tone and the appearance of scoliosis symptoms. The spine was investigated using optoelectronic Diers formetric III 4D. Photogrammetric method allows the video recording back surface using stereographic process raster. The study was conducted in 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. Scoliotic posture occurred when pelvic tilt was 1-5 mm, and at the same time, the lateral deviation was 1-5 mm, and surface rotation was 1-5 ° C. Scoliosis occurred when pelvic tilt, lateral deviation were greater than 5 mm (> 5 mm), and surface rotation was greater than 5 degrees (> 5 °). To assess the incidence of idiopathic scoliosis or scoliosis posture all three conditions had to be met.

Before starting the test calculations made Kolmogorov-Smirnov determine the normal distribution of variables scoliotic and SEMG. To assess whether idiopathic scoliosis and variable amplitude of SEMG, differ significantly between gender groups scoliosis, scoliotic attitudes, and standards as well as whether the level between the two groups differs significantly among girls and boys used one-way ANOVA.

Results

The test body posture and spinal by Diers formetric III 4D shown in 103 (41%) children scoliosis. The attitude of idiopathic scoliosis was observed in 141 (56.17%) children. With the proper attitude was only 7 (3.0%) children. In children with scoliosis occurred more frequently in the thoracic curvature. In girls, it represented (62%) and boys (56%). In the group of children with idiopathic scoliosis attitude also the most frequent location of the rib

curvature. In girls, it represented (49%) and boys (45%). In the group with the most standard trace occurred thoraco-lumbar curvature. In girls, it represented (75%) and boys 33%. The location of lumbar scoliosis was found most frequently in the group with the norm in boys (67%). In girls in the group were found most frequently scoliosis curvature of the left-hand direction (41%) in the same group attitudes scoliotic (33%). The right-hand direction of curvature was found most often in the boys attitudes scoliotic group (28%) and normal (67%). On the other hand, right-hand / left-hand direction of curvature was found most frequently in girls with the standard group (75%), and in boys with scoliosis (36%) (Tab. 1). The greatest variation occurred absolute lie ahead for variable lumbar right side of the girls from the group of scoliosis (S = 47.58), group attitudes scoliotic (S = 47.22) and the group with the standard (S = 56.48), as well as among boys from scoliosis (S = 51.33) and attitudes scoliotic (S = 47.00). In the group of boys norm among the largest observed differences in absolute value for a variable upper body upright thoracic (S = 48.29) (tab. 2,3,4,5,6,7). Univariate analysis of variance showed significant differences among boys in intra-amplitude measurements SEMG variable lower limbs up the left side of the lumbar (p = 0.03). This means that the distribution values of the lower limbs at the top left side of the lumbar differ significantly between the group's attitudes scoliotic, scoliosis and normal, and the value of the significance level was less than 0.5 ($p < 0.05$) (Tab. 8). Univariate analysis of variance showed significant differences among boys in intra-amplitude measurements SEMG variable lower limbs up the left side of the lumbar (p = 0.03). This means that the distribution values of the lower limbs at the top left side of the lumbar differ significantly between the group's attitudes scoliotic, scoliosis and normal, and the value of the significance level was less than 0.5 ($p < 0.05$) (Tab. 8). Univariate analysis of variance showed significant differences among boys in intra-amplitude measurements SEMG variable lower limbs up the left side of the lumbar (p = 0.03). This means that the distribution values of the lower limbs at the top left side of the lumbar differ significantly between the group's attitudes scoliotic, scoliosis and normal, and the value of the significance level was less than 0.5 ($p < 0.05$) (Tab. 8).

Discussion

Many authors see the primary causes of scoliosis imbalances in muscle [18-20]. The unequal amplitude of SEMG rectifier on both sides of the spine curvature is a characteristic element of the picture scoliosis. The reason for muscle imbalances on both sides of the spine

is considered to changes arising in the CNS. Maintenance of muscle balance on both sides of the spine requires the involvement of the central and peripheral nervous system structures are located at the level of the spinal cord and nerve structures and roads at the supraspinal level, that are involved in the regulation of muscle tension and synergy [21-25]. The most important role is attributed to these structures, which are located on the red-spinal level and at the level of the thalamus and the and globus pallidus. Primary muscle imbalance leads to lateral bending of the spine and further to change the passive apparatus supporting the spine, resulting in scoliosis structural [26-28]. Electromyographic Research shows that the differences in the structure of the muscles on both sides of the curvature also manifests itself in the image SEMG amplitude. On the convex side are found in most cases greater EMG amplitude [29]. It is finally explained how to shape the image of the back of SEMG rectifier depending on the type of scoliosis and what changes occur in it during physiotherapy. If we could determine the direction of these changes, the analysis of the amplitude of SEMG could complement diagnostic tests and would favor obtaining a fuller assessment of whether the treatment of scoliosis runs correctly [30]. Many studies show.

Conclusions

Univariate analysis of variance showed significant differences among boys in intra-amplitude measurements SEMG variable lower limbs up the left side of the lumbar. This means that the value of the amplitude distribution SEMG rectifier ridge in the study of lower limbs up the left side of the lumbar differed significantly between the group's scoliotic attitudes, scoliosis and normal. The amplitude of SEMG rectifier ridge in the study of lower limbs up the lumbar left was the lowest in the group of scoliosis. Due to the fact that a group of boys with scoliosis had most of the left-hand direction of curvature in the lumbar region, we can conclude that the greater the amplitude of SEMG rectifier occurred at the back of the concave side of the curvature of the lumbar spine.

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Table 1. Location and direction of curvature

Location of the curvature in girls						
Location of the curvature	Scoliosis		Scoliotic posture		Correct posture	
	N	%	N	%	N	%
Thoracic	**24**	**62**	**34**	**49**	0	0
Thoraco-lumbar	8	21	24	34	**3**	**75**
Lumbar	7	18	12	17	1	25
Location of the curvature in boys						
Location of the curvature	Scoliosis		Scoliotic posture		Correct posture	
	N	%	N	%	N	%
Thoracic	**36**	**56**	**32**	**45**	0	0
Thoraco-lumbar	19	30	26	37	1	33
Lumbar	9	14	13	18	**2**	**67**
Direction of curvature in girls						
Location of the curvature	Scoliosis		Scoliotic posture		Correct posture	
	N	%	N	%	N	%
Left	**16**	**41%**	**23**	**33%**	0	0%
Right	14	36%	21	30%	1	25%
Left/Right	3	8%	6	9%	0	0%
Right/Left	6	15%	20	29%	**3**	**75%**
Direction of curvature in boys						
Location of the curvature	Scoliosis		Scoliotic posture		Correct posture	
	N	%	N	%	N	%
Left	18	28%	18	25%	0	0%
Right	18	28%	**20**	**28%**	**2**	**67%**
Left/Right	5	8%	15	21%	1	33%
Right/Left	**23**	**36%**	18	25%	0	0%

Table 2 Distribution of SEMG amplitude of the erector spinae frequency in girls with scoliosis

Variable	Average	Confidence interval		Minimum	Maximum	Standard deviation
		-95,00%	95,00%			
Standing position, chest segment, left side	21,25	19,39	23,12	10,70	37,20	5,75
Standing position of the chest segment right side	32,05	24,14	39,96	9,86	72,40	24,39
Standing position lumbar segment left side	20,73	17,54	23,92	7,10	34,80	9,85
Standing position lumbar section right side	50,47	36,54	64,40	10,50	122,00	42,97
Lying in front of the chest segment left side	31,54	25,18	37,89	12,40	97,50	19,61
Lying in front of the chest segment right side	38,46	30,42	46,51	6,73	78,20	24,82
Lying on the left side of the lumbar region	20,96	16,30	25,62	4,88	51,50	14,38
Lying on the right side of the lumbar section	46,83	31,40	62,25	6,21	127,00	47,58
Torso up chest segment left side	53,11	44,16	62,05	22,00	124,00	27,59
Torso up chest segment right side	68,83	61,50	76,16	33,10	128,00	22,61
Torso up the lumbar section of the left side	52,53	43,75	61,30	25,50	118,00	27,07
Torso up the lumbar section of the right side	76,65	63,26	90,03	26,20	180,00	41,29
Lower limbs up chest segment left side	36,42	30,36	42,47	16,00	90,80	18,68
Lower limbs up chest segment right side	47,05	41,07	53,03	19,30	81,90	18,45
Lower limbs up the left lumbar spine	63,44	52,35	74,53	15,20	149,00	34,21
Lower limbs up the lumbar segment right side	94,48	79,19	109,78	14,50	224,00	47,20

Table 3 Distribution of SEMG amplitude of the erector spinae frequency in girls with scoliotic posture

Variable	Average	Confidence interval		Minimum	Maximum	Standard deviation
		-95,00%	95,00%			
Standing position, chest segment, left side	20,99	19,70	22,29	9,08	44,70	5,43
Standing position of the chest segment right side	33,62	27,82	39,42	6,62	73,50	24,31
Standing position lumbar segment left side	22,40	19,99	24,81	6,08	45,30	10,10
Standing position lumbar section right side	50,95	40,22	61,69	8,63	124,00	45,04
Lying in front of the chest segment left side	27,48	23,74	31,23	8,49	97,50	15,71
Lying in front of the chest segment right side	37,37	31,41	43,32	5,03	110,00	24,97
Lying on the left side of the lumbar region	19,73	16,51	22,96	3,28	52,20	13,53
Lying on the right side of the lumbar section	46,67	35,41	57,92	4,76	126,00	47,22
Torso up chest segment left side	51,24	44,96	57,52	22,00	130,00	26,34
Torso up chest segment right side	65,70	60,66	70,73	27,60	139,00	21,12
Torso up the lumbar section of the left side	48,36	42,99	53,73	16,30	109,00	22,52
Torso up the lumbar section of the right side	73,24	64,95	81,54	17,60	124,00	34,78
Lower limbs up chest segment left side	34,08	30,01	38,15	15,50	119,00	17,07
Lower limbs up chest segment right side	49,07	43,05	55,09	13,40	158,00	25,24
Lower limbs up the left lumbar spine	63,50	54,50	72,50	15,20	201,00	37,75
Lower limbs up the lumbar segment right side	20,99	19,70	22,29	9,08	44,70	5,43

Table 4. Distribution of SEMG amplitude of the erector spinae frequency in girls with correct posture

Variable	Average	Confidence interval		Minimum	Maximum	Standard deviation
		-95,00%	95,00%			
Standing position, chest segment, left side	27,18	21,94	32,41	23,40	30,70	3,29
Standing position of the chest segment right side	37,75	8,29	67,21	20,60	64,00	18,52
Standing position lumbar segment left side	19,29	2,83	35,74	9,95	31,30	10,34
Standing position lumbar section right side	42,78	-30,00	115,55	13,50	111,00	45,74
Lying in front of the chest segment left side	20,20	10,66	29,74	12,40	25,20	5,99
Lying in front of the chest segment right side	27,88	-22,49	78,25	6,73	75,00	31,65
Lying on the left side of the lumbar region	11,56	-11,63	34,74	3,63	33,40	14,57
Lying on the right side of the lumbar section	36,28	-53,59	126,15	7,85	121,00	56,48
Torso up chest segment left side	44,68	11,36	77,99	22,90	69,80	20,94
Torso up chest segment right side	58,90	34,53	83,27	40,10	76,40	15,32
Torso up the lumbar section of the left side	55,23	21,83	88,62	31,00	77,00	20,99
Torso up the lumbar section of the right side	73,33	25,84	120,81	38,10	110,00	29,84
Lower limbs up chest segment left side	32,03	9,81	54,24	16,00	44,60	13,96
Lower limbs up chest segment right side	43,93	13,84	74,01	28,90	71,60	18,91
Lower limbs up the left lumbar spine	66,05	17,02	115,08	33,30	94,30	30,82
Lower limbs up the lumbar segment right side	99,28	33,48	165,07	38,10	129,00	41,35

Table 5. Distribution of SEMG amplitude of the erector spinae frequency in boys with scoliosis

Variable	Average	Confidence interval		Minimum	Maximum	Standard deviation
		-95,00%	95,00%			
Standing position, chest segment, left side	23,61	20,44	26,79	8,11	72,30	12,72
Standing position of the chest segment right side	32,35	26,25	38,45	8,05	73,70	24,42
Standing position lumbar segment left side	27,98	23,71	32,25	7,31	107,00	17,08
Standing position lumbar section right side	53,63	41,58	65,68	8,83	221,00	48,23
Lying in front of the chest segment left side	24,75	21,86	27,63	8,11	60,80	11,55
Lying in front of the chest segment right side	37,71	31,14	44,29	7,76	114,00	26,31
Lying on the left side of the lumbar region	22,39	17,01	27,76	4,17	110,00	21,51
Lying on the right side of the lumbar section	47,84	35,02	60,66	6,04	222,00	51,33
Torso up chest segment left side	56,01	48,25	63,77	20,30	130,00	31,07
Torso up chest segment right side	67,76	60,49	75,04	18,10	176,00	29,11
Torso up the lumbar section of the left side	55,36	48,16	62,56	15,50	140,00	28,82
Torso up the lumbar section of the right side	78,55	68,74	88,36	13,40	225,00	39,26
Lower limbs up chest segment left side	38,60	32,84	44,37	16,00	153,00	23,08
Lower limbs up chest segment right side	53,61	45,02	62,21	12,30	194,00	34,41
Lower limbs up the left lumbar spine	64,47	55,79	73,15	15,20	194,00	34,76
Lower limbs up the lumbar segment right side	95,00	84,47	105,54	14,50	252,00	42,18

Table 6. Distribution of SEMG amplitude of the erector spinae frequency in boys with scoliotic posture

Variable	Average	Confidence interval		Minimum	Maximum	Standard deviation
		-95,00%	95,00%			
Standing position, chest segment, left side	19,97	17,99	21,94	8,79	58,50	8,35
Standing position of the chest segment right side	30,48	24,37	36,59	5,63	75,00	25,81
Standing position lumbar segment left side	26,58	23,27	29,89	5,18	101,20	13,99
Standing position lumbar section right side	49,98	39,56	60,40	7,50	127,00	44,03
Lying in front of the chest segment left side	22,75	20,34	25,17	10,20	66,60	10,20
Lying in front of the chest segment right side	31,58	25,93	37,22	5,17	78,20	23,85
Lying on the left side of the lumbar region	17,72	13,74	21,71	3,80	101,20	16,82
Lying on the right side of the lumbar section	41,92	30,80	53,05	5,03	126,00	47,00
Torso up chest segment left side	53,73	47,60	59,87	22,00	119,00	25,91
Torso up chest segment right side	69,65	64,04	75,27	26,70	151,00	23,73
Torso up the lumbar section of the left side	51,89	46,03	57,75	19,50	128,00	24,76
Torso up the lumbar section of the right side	74,08	66,11	82,04	16,40	126,00	33,65
Lower limbs up chest segment left side	40,55	34,83	46,28	17,80	133,00	24,20
Lower limbs up chest segment right side	56,05	48,22	63,87	12,30	211,00	33,04
Lower limbs up the left lumbar spine	62,73	55,52	69,94	0,77	138,00	30,46
Lower limbs up the lumbar segment right side	91,86	84,20	99,53	28,50	157,00	32,39

Table 7. Distribution of SEMG amplitude of the erector spinae frequency in boys with correct posture

Variable	Average	Confidence interval		Minimum	Maximum	Standard deviation
		-95,00%	95,00%			
Standing position, chest segment, left side	14,72	4,23	25,20	9,85	17,40	4,22
Standing position of the chest segment right side	11,51	1,86	21,16	7,03	13,90	3,88
Standing position lumbar segment left side	29,07	-3,26	61,39	18,80	43,70	13,01
Standing standing lumbar section right side	31,77	23,93	39,61	28,20	34,20	3,16
Lying in front of the chest segment left side	22,43	1,56	43,30	15,10	31,60	8,40
Lying in front of the chest segment right side	18,53	1,40	35,67	12,60	26,10	6,90
Lying on the left side of the lumbar region	6,49	4,65	8,32	5,71	7,18	0,74
Lying on the right side of the lumbar section	8,60	4,81	12,39	7,05	10,10	1,53
Torso up chest segment left side	75,80	-42,83	194,43	39,90	130,00	47,76
Torso up chest segment right side	76,23	-43,73	196,20	32,40	128,00	48,29
Torso up the lumbar section of the left side	61,77	23,25	100,28	44,30	73,90	15,50
Torso up the lumbar section of the right side	63,97	32,50	95,43	51,70	77,00	12,67
Lower limbs up chest segment left side	46,50	-20,37	113,37	24,20	76,40	26,92
Lower limbs up chest segment right side	40,60	-25,23	106,43	25,00	71,20	26,50
Lower limbs up the left lumbar spine	114,23	43,54	184,93	95,70	147,00	28,46
Lower limbs up the lumbar segment right side	100,97	95,87	106,06	98,90	103,00	2,05

Table 8. Analysis of ANOVA differences for EMG amplitude of the spine rectifier between scoliosis, scoliosis and norm groups in girls and boys

Variable	Girls		Boys	
	F	p	F	p
Standing position, chest segment, left side	2,40	0,10	2,64	0,08
Standing position, chest segment right side	0,13	0,88	1,02	0,36
Standing position lumbar segment left side	0,47	0,63	0,16	0,85
Standing position lumbar section right side	0,06	0,94	0,39	0,68
Lying in front of the chest segment left side	1,22	0,30	0,59	0,55
Lying in front of the chest segment right side	0,32	0,73	1,63	0,20
Lying on the left side of the lumbar region	0,84	0,43	1,74	0,18
Lying on the right side of the lumbar section	0,09	0,91	1,05	0,35
Torso up chest segment left side	0,20	0,82	0,88	0,42
Torso up chest segment right side	0,53	0,59	0,20	0,82
Torso up the lumbar section of the left side	0,47	0,63	0,43	0,65
Torso up the lumbar section of the right side	0,11	0,90	0,42	0,65
Lower limbs up chest segment left side	0,27	0,76	0,24	0,79
Lower limbs up chest segment right side	0,17	0,85	0,35	0,70
Lower limbs up the left lumbar spine	0,01	0,99	**3,61**	**0,03**
Lower limbs up the lumbar segment right side	0,77	0,46	0,18	0,83