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SEMG frequency of the erector spinae in children with lesions scoliotic

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Abstract

The aim of the study was to analyze the frequency of SEMG rectifier spine in children with scoliosis. Analysis electromyographic rectifier spine was performed using a 12-channel camera Noraxon TeleMyo DTS. 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). 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%). In boys, thoracic scoliosis twoarched right-handed and left-sided lumbar were 19 (30%). The largest absolute differences in the frequency of EMG rectifier spine in girls with scoliosis group occurred lying ahead for the variable lumbar left (S

= 36, 99). In turn, the value of the variable lower limbs up the right side of the lumbar was absolutely the most diverse among boys in the group of scoliosis (S = 40.54). Univariate analysis of variance indicated that there are significant differences in the measurements of intra-frequency variable SMEG rectifier spine torso upright thoracic among boys (p = 0.04). This means that the values of the variables were significantly different between groups attitudes scoliotic, scoliosis and normal boys, and the value of the significance level was less than 0.5 (p <0.05). Due to the fact that in the group of boys had most of the right-hand direction in thoracic scoliosis, we can conclude that the higher the frequency of the rectifier occurred at the back side of the convex curvature of the thoracic spine. In turn, the value of the variable lower limbs up the right side of the lumbar was absolutely the most diverse among boys in the group of scoliosis (S = 40.54). Univariate analysis of variance indicated that there are significant differences in the measurements of intra-frequency variable SMEG rectifier spine torso upright thoracic among boys (p = 0.04). This means that the values of the variables were significantly different between groups attitudes scoliotic, scoliosis and normal boys, and the value of the significance level was less than 0.5 (p <0.05). Due to the fact that in the group of boys had most of the right-hand direction in thoracic scoliosis, we can conclude that the higher the frequency of the rectifier occurred at the back side of the convex curvature of the thoracic spine. In turn, the value of the variable lower limbs up the right side of the lumbar was absolutely the most diverse among boys in the group of scoliosis (S = 40.54). Univariate analysis of variance indicated that there are significant differences in the measurements of intra-frequency variable SMEG rectifier spine torso upright thoracic among boys (p = 0.04). This means that the values of the variables were significantly different between groups attitudes scoliotic, scoliosis and normal boys, and the value of the significance level was less than 0.5 (p <0.05). Due to the fact that in the group of boys had most of the right-hand direction in thoracic scoliosis, we can conclude that the higher the frequency of the rectifier occurred at the back side of the convex curvature of the thoracic spine. Univariate analysis of variance indicated that there are significant differences in the measurements of intra-frequency variable SMEG rectifier spine torso upright thoracic among boys (p = 0.04). This means that the values of the variables were significantly different between groups attitudes scoliotic, scoliosis and normal boys, and the value of the significance level was less than 0.5 (p <0.05). Due to the fact that in the group of boys had most of the right-hand direction in thoracic scoliosis, we can conclude that the higher the frequency of the rectifier occurred at the back side of the convex curvature of the thoracic spine. Univariate analysis of variance indicated that there are significant differences in the measurements of intra-frequency variable SMEG rectifier spine torso upright thoracic among boys (p = 0.04). This means that the values of the variables were significantly different between groups attitudes scoliotic, scoliosis and normal boys, and the value of the significance level was less than 0.5 (p <0.05). Due to the fact that in the group of boys had most of the right-hand direction in thoracic scoliosis, we can conclude that the higher the frequency of the rectifier occurred at the back side of the convex curvature of the thoracic spine.

Key words: frequency of the rectifier SEMG back, scoliosis, posture in idiopathic scoliosis, Noraxon TeleMyo DTS Diers formetric III 4D

Introduction

In the treatment of scoliosis valid view that wish get a lasting effect correction regardless of the location of the curvature (thoracic, lumbar) should be elongate muscles side concave curvature and strengthen the muscles of the convex side of the curvature. However, is it really so? Is the back of the charger (Lat. Erector spinae) regardless of location contorted it is always on the side of the concavity and convexity stretched side curvature? In the scientific literature on this topic, there are conflicting reports. The stabilization of the spine special role the deep muscles of the back. Deep muscles of the back as a whole are called the back of the rectifier (lat. Erector spinae) [1,2]. Previous studies electromyographic show that differences in the structure of the muscle on either side of the curvature also manifests itself in the image electromyographic [3,4]. It is finally explained how to shape the image of the frequency and amplitude of SEMG rectifier spine depending on the type of scoliosis and what changes occur in it during the conservative treatment [5-8]. If we could determine the direction of these changes, the SEMG signal analysis could complement the basic diagnostic tests and would favor obtaining a more complete assessment. [9-12]. Some studies show the voltage change of the back muscles are first torque perceptible development of idiopathic scoliosis [13-15]. Unequal bioelectric activity on both sides of the curvature is a characteristic element of the picture SEMG [16]. The essence of treatment of scoliosis is often able to predict who will progressing curvature, and which are not. Hence there were attempts to use SEMG research to predict the progression of idiopathic scoliosis. The aim of the study was to analyze the frequency of SEMG rectifier spine in children with scoliosis. Hence there were attempts to use SEMG research to predict the progression of idiopathic scoliosis. The aim of the study was to analyze the frequency of SEMG rectifier spine in children with scoliosis. Hence there were attempts to use SEMG research to predict the progression of idiopathic scoliosis. The aim of the study was to analyze the frequency of SEMG rectifier spine in children with scoliosis.

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 groups 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 electromyographic analysis was performed using a 12-channel camera Noraxon TeleMyo DTS. The unit had an EC certificate (Certification Production Quality Assurance Directive 93/42 / EEC Medical Devices Annex V). Prezelowych electrodes were used having a diameter of 3 cm. For help and electromyographic studies may with the show was related and my relation shipe between I disorderrtsniowym and emerge outę other symptoms, in this case of scoliosis. The skin was examined using purified and abrasive fluid, the site of the applied with to an electrode. 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. Each test lasted 10 seconds. Raw recording electromyographic signal was presented in the form of a bar chart. Taking into account the average frequency of the voltage dorsal extensor muscle, expressed in hertz (Hz) and the median. On Y-axis is a frequency of the voltage, 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 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. in 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.

Analyzed average SEMG signal frequency spectrum used to assess the degree of muscle fatigue, muscle work time characteristics (lack of stimulation, constant activity, improper stimulation - early, late, too short, too long). SEMG analysis 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 and lying a series of guidelines on the choice of the type of electrodes, their location, anatomy and function of muscle present, tests, group muscles and signal processing conditions and equipment. The spine was assessed using optoelectronic Diers formetric III 4D. The photogrammetric method allows the video recording back surface using stereographic process raster. On the basis of the data was created a precise, three-dimensional model of the spine. The study was conducted in the dam 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 was greater than 5 mm (> 5 mm), and surface rotation was greater than 5 degrees (> 5 °). To assess the occurrence of scoliotic posture or scoliosis, all three conditions had to be met [20].

Before starting the test, calculations made Kolmogorov-Smirnov to determine the normal distribution of variables scoliotic and SEMG. To assess whether the variables and the frequency of idiopathic scoliosis 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 spine by Diers for metric 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 measures the position and dispersion for variable postures have different distributions of variables in girls and boys in groups scoliotic attitudes, scoliosis and normal. 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%). In boys, thoracic scoliosis two archers right-handed and left-sided lumbar were 19 (30%). In the group of children with idiopathic scoliosis attitude also the most frequent location of the rib curvature. In girls, it represented (49%) in boys (45%). In the group with the standard, it was found most frequently thoracolumbar scoliosis trace the location. 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%). The left-hand direction of curvature was found most often in girls in the group of scoliosis (41%) and group attitudes scoliotic (33%). The right-hand direction of curvature was found most often in boys attitudes scoliotic group (28%) and normal (67%). On the other hand, right-hand / left-hand direction of curvature was found most often in girls in the group with standard (75%), as well as scoliosis boys (36%) (Tab. 1). Location and value measurement of dispersion for these variable frequency EMG rectifier ridge have different distributions in girls and boys in groups scoliotic attitudes, scoliosis and normal (tab. 2,3,4,5,6,7). The biggest differences in absolute value in girls with scoliosis group occurred lying ahead for the variable lumbar left (S = 36.99). In turn, the value of the variable lower limbs up the right side of the lumbar were absolutely the most diverse group of girls in attitudes scoliotic (S = 37.5) in the standard group (S = 40.44), as well as among the boys in the group of scoliosis (S = 40.54) and attitudes scoliotic (S = 35.37). In boys, in the group with the highest standard, it was observed differences in absolute values for the variable lower limbs up the left side of the lumbar (S = 42.16). Univariate analysis of variance indicated that there are significant differences in the measurements of intra-variable torso upright thoracic among boys (p = 0.04). This means that the values of the variables were significantly different between groups attitudes scoliotic, scoliosis and normal boys, and the value of the significance level was less than 0.5 (p <0.05) (Tab. 8). 44) as well as of scoliosis boys in the group (S = 40.54) and attitudes scoliotic (S = 35.37). 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Discussion

The modern approach to active stabilization of the spine in scoliosis has its roots in the work of Wejsflog [17] Kapadja [18] Bergmark [19], Panjabi [20], Cresswell [21], Snijders and Vleming [22]. The stabilization of the spine special role the deep muscles of the back. Deep muscles of the spine as a whole are called rectifier spine (lat. erector spinae). In humans, the primary segmental layout muscle fibers is preserved in the deepest layer, whereas in the more superficial layers of the muscular bands become longer and in its course over a larger number of vertebrae. The number of muscle fibers and trailers, let stand arrangement transversely-spinalis, interspinous and between transverse. The normal shape of the spine maintains deep muscles of the back that work the muscles of the neck, superficial back, chest, abdomen, buttocks and lower extremities. The most complex is the role of short back muscles. The most important are the muscles and between transverse interspinal that as stabilizers of the spine, but are subject to our will, usually operate if they are stimulated by stretching. This means that as a result of activation of muscles, which is one of the attachments than the vertebral column, they are activated to restore the disturbed balance of the spine. Among the short back, muscles are the most important muscle triad: multifidus (lat. multifidus), twisting long (lat. rotatores longi) and twisting short (lat. rotatores brevi). A triad is a cascade-connected in series and overlapping bands of movement. In the lumbar stretch, especially muscle between transverse occurs on the convex side. The oblique course of these muscles in the thoracic and the fact that the slope at the side of the spinous processes are guided toward the bulge cause the muscles are stretched on the concave side of the triad. Thus, the imbalance is restored in the two sections of the deep muscles differently sized, ipsilaterally, thoracic and lumbar in the contralateral [23]. This view is confirmed by our study, where the higher the frequency of the rectifier spine in boys occurred at the convex side of the curvature of the thoracic spine. the muscles are stretched triad on the concave side. Thus, the imbalance is restored in the two sections of the deep muscles differently sized, ipsilaterally, thoracic and lumbar in the contralateral [23]. This view is confirmed by our study, where the higher the frequency of the rectifier spine in boys occurred at the convex side of the curvature of the thoracic spine. the muscles are stretched triad on the concave side. Thus, the imbalance is restored in the two sections of the deep muscles differently sized, ipsilaterally, thoracic and lumbar in the contralateral [23]. This view is confirmed by our study, where the higher the frequency of the rectifier spine in boys occurred at the convex side of the curvature of the thoracic spine.

Conclusions

Univariate analysis of variance indicated that there are significant differences in the measurements of intra-frequency variable SEMG rectifier spine torso upright thoracic among boys. This means that the values of the variables differed significantly between the groups' scoliotic attitudes, scoliosis and normal boys. Due to the fact that in the group of boys had most of the right-hand direction in thoracic scoliosis, we can conclude that the higher the frequency of the rectifier occurred at the back side of the convex curvature of the thoracic spine.

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Table 1 Direction of curvature

Direction of curvature in girls						
Direction of curvature	Scoliosis		scoliotic posture		Correct posture	
	N	%	N	%	N	%
Left	**16**	**41%**	**23**	**33%**	0	0%
Right	14	36%	21	thirty%	1	25%
Left / Right	3	8%	6	9%	0	0%
Right / Left	6	15%	20	29%	**3**	**75%**
Direction of curvature in boys						
Direction of 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%
The direction of curvature in the 7-year-olds						
Direction of curvature	Scoliosis		scoliotic posture		Correct posture	
	N	%	N	%	N	%
Left	**19**	**37%**	**25**	**33%**	0	0%
Right	15	29%	24	32%	**2**	**100%**
Left / Right	8	15%	13	17%	0	0%
Right / Left	10	19%	14	18%	0	0%
The direction of curvature in 8-year-olds						
Direction of curvature	Scoliosis		scoliotic posture		Correct posture	
	N	%	N	%	N	%
Left	15	29%	16	25%	0	0%
Right	17	33%	17	26%	1	20%
Left / Right	0	0%	8	12%	1	20%
Right / Left	**19**	**37%**	**24**	**37%**	**3**	**60%**

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

Variable	Average	Confidence interval		Minimum	Maximum	Standard deviation
		-95.00%	95.00%			
Standing position, the segment of the chest, left a side	52.84	44.29	61.38	15.70	88.10	26.36
Standing position of the segment right side chest	55.61	46.56	64,66	17,00	92.20	27.92
Standing position lumbar segment of the left side	83.92	73.23	94.61	23.20	151,00	32.97
Standing position lumbar section right side	63.15	53.43	72.88	1.82	165.00	29.99
Lying in front of the chest segment of the left side	59.16	50.78	67.53	17.40	90.10	25.83
Lying in front of the chest segment of the right side	63.30	54.45	72.14	21,00	93.80	27.28
Lying on the left side of the lumbar region	72.60	60.61	84.59	20.90	140.00	36.99
Lying on the right side of the lumbar section	46.65	38.56	54,74	19,20	128.00	24.95
Torso up chest segment left side	82.46	77.37	87.55	52.70	119,00	15.71
Torso up chest right side segment	82.09	77.21	86.97	52,10	112.00	15.06
Torso up the lumbar section of the left side	109.30	105.21	113.39	84.70	141.00	12.62
Torso up the lumbar section of the right side	88.92	78.07	99.77	49.90	166.00	33.47
Lower limbs up the segment of the left side chest	61.76	55.49	68.02	22.30	84.60	19.32
Lower limbs up the segment of the chest right side	66.86	60.84	72.87	32.10	92.30	18.56
Lower limbs up the left lumbar spine	107.56	101.89	113.24	72.70	159.00	17.51
Lower limbs up the lumbar segment of the right side	82.88	71.29	94.47	14.10	165.00	35.77

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

Variable	Average	Confidence interval		Minimum	Maximum	Standard deviation
		-95.00%	95.00%			
Standing position, the segment of the chest, left a side	54,44	48.32	60.57	2.20	88.10	25.68
Standing position of the segment right side chest	62.77	56.42	69.12	2.09	98.50	26,62
Standing position lumbar segment of the left side	84,77	76,70	92.84	2.31	150.00	33.83
Standing position lumbar section right side	55.76	49.71	61,80	2.63	165.00	25.35
Lying in front of the chest segment of the left side	62.59	56,59	68.60	2.54	104.00	25.17
Lying in front of the chest segment of the right side	71.18	65.54	76.83	2.33	95.30	23.67
Lying on the left side of the lumbar region	73.75	65.39	82.10	2.67	127.00	35.03
Lying on the right side of the lumbar section	47.77	42.20	53.35	3.08	128.00	23.40
Torso up chest segment left side	82.17	77.95	86.38	0.57	117,00	17.66
Torso up chest right side segment	83.19	79,04	87.33	0.61	122,00	17,38
Torso up the lumbar section of the left side	108.39	103.68	113.10	0.68	144,00	19.77
Torso up the lumbar section of the right side	84.75	76.86	92.64	0.66	157,00	33.09
Lower limbs up the segment of the left side chest	65.78	61.22	70.33	1.66	91.70	19.09
Lower limbs up the segment of the chest right side	71.03	66.38	75.69	0.93	92.30	19.53
Lower limbs up the left lumbar spine	106.00	99.29	112.72	0.54	154,00	28.16
Lower limbs up the lumbar segment of the right side	85.10	76.16	94,05	0.51	161.00	37.50

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

Variable	Average	Confidence interval		Minimum	Maximum	Standard deviation
		-95.00%	95.00%			
Standing position, the segment of the chest, left a side	57.80	6.47	109.13	24.70	88.10	32.26
Standing position of the segment right side chest	62,00	17.39	106.61	25.30	90.10	28.03
Standing position lumbar segment of the left side	92.75	64.17	121.33	66,60	105.00	17.96
Standing position lumbar section right side	57.08	32.70	81.45	41,10	77.00	15.32
Lying in front of the chest segment of the left side	41.78	-7.84	91.39	18.40	85,80	31.18
Lying in front of the chest segment of the right side	44.13	-7.18	95.43	23.80	92.20	32,24
Lying on the left side of the lumbar region	58.95	5.20	112.70	33,00	108.00	33.78
Lying on the right side of the lumbar section	33,38	11.71	55.04	22.20	50,80	13.61
Torso up chest segment left side	101.98	77.30	126,65	82.40	119,00	15.51
Torso up chest right side segment	81,83	61.24	102.41	65.60	92.30	12.94
Torso up the lumbar section of the left side	113.50	88.42	138.58	104.00	137.00	15.76
Torso up the lumbar section of the right side	91,10	41.04	141.16	50,40	124,00	31,46
Lower limbs up the segment of the left side chest	58.05	30.74	85.36	44.50	83.20	17.16
Lower limbs up the segment of the chest right side	63,98	33.41	94.54	45.90	91.00	19,21
Lower limbs up the left lumbar spine	113.15	73.24	153,06	94.60	150.00	25.08
Lower limbs up the lumbar segment of the right side	92.68	28.33	157.02	50,30	147.00	40.44

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

Variable	Average	Confidence interval		Minimum	Maximum	Standard deviation
		-95.00%	95.00%			
Standing position, the segment of the chest, left a side	58.13	52.22	64.04	19.70	99.30	23.66
Standing position of the segment right side chest	65.39	59.52	71.26	27.60	102.00	23.51
Standing position lumbar segment of the left side	92,67	84.89	100.45	25.10	174.00	31,16
Standing position lumbar section right side	65.59	58,60	72.58	1.53	165.00	27.99
Lying in front of the chest segment of the left side	64.59	57.67	71.51	18.70	114,00	27,70
Lying in front of the chest segment of the right side	75.42	69.35	81.49	29.10	126,00	24.30
Lying on the left side of the lumbar region	72.50	63.37	81.63	22.20	127.00	36.54
Lying on the right side of the lumbar section	48.55	42.01	55.08	3.10	128.00	26.15
Torso up chest segment left side	87.27	84.35	90.19	52.00	123,00	11.68
Torso up chest right side segment	88.95	85.27	92.62	47.40	138,00	14.72
Torso up the lumbar section of the left side	116.68	112.40	120.96	74,50	158,00	17.13
Torso up the lumbar section of the right side	94.17	84.97	103.37	7.30	158,00	36.85
Lower limbs up the segment of the left side chest	68.00	64.18	71.82	29.70	87.40	15.29
Lower limbs up the segment of the chest right side	75.03	70.52	79.54	22,70	104.00	18.06
Lower limbs up the left lumbar spine	114.11	108,30	119.92	25.60	174.00	23.25
Lower limbs up the lumbar segment of the right side	89.07	78.94	99,20	3.19	170.00	40.54

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

Variable	Average	Confidence interval		Minimum	Maximum	Standard deviation
		-95.00%	95.00%			
Standing position, the segment of the chest, left a side	53,87	48.06	59.69	15.70	92.30	24.59
Standing position of the segment right side chest	60.47	54.51	66.44	17,00	92.30	25.20
Standing position lumbar segment of the left side	97.59	91.13	104,06	31.00	152.00	27.32
Standing position lumbar section right side	67.65	61.05	74.24	21,00	147.00	27.87
Lying in front of the chest segment of the left side	57.19	51.02	63.36	17.40	114,00	26.06
Lying in front of the chest segment of the right side	68.63	63.18	74.07	21,00	126,00	23.00
Lying on the left side of the lumbar region	67.88	60,05	75.71	21,00	127.00	33.10
Lying on the right side of the lumbar section	40.81	36.02	45.59	20.60	135.00	20.22
Torso up chest segment left side	86.38	82.94	89,83	59.70	135.00	14.54
Torso up chest right side segment	85.04	81.78	88.31	38.90	114,00	13.80
Torso up the lumbar section of the left side	114.38	110.68	118.08	76,00	149.00	15.63
Torso up the lumbar section of the right side	93.76	85.94	101.58	49.90	158,00	33,05
Lower limbs up the segment of the left side chest	67.77	63.70	71.84	29.70	103,00	17.19
Lower limbs up the segment of the chest right side	72.96	68,94	76.98	43.70	106.00	16.97
Lower limbs up the left lumbar spine	116.02	111.80	120.24	75.00	145.00	17.83
Lower limbs up the lumbar segment of the right side	93.37	85,00	101.75	48.20	154,00	35.37

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

Variable	Average	Confidence interval		Minimum	Maximum	Standard deviation
		-95.00%	95.00%			
Standing position, the segment of the chest, left a side	34.30	14.26	54,34	26.90	42.90	8.07
Standing position of the segment right side chest	42.70	31,87	53.53	39.70	47,70	4.36
Standing position lumbar segment of the left side	109.13	78,50	139,77	99,40	123,00	12.33
Standing standing lumbar section right side	100.43	79,85	121.02	95.50	110.00	8.29
Lying in front of the chest segment of the left side	48.27	19.02	77.52	35.50	58.70	11.77
Lying in front of the chest segment of the right side	63,90	46.24	81,56	59.50	72.10	7.11
Lying on the left side of the lumbar region	42.50	14.85	70.15	30.30	52,10	11,13
Lying on the right side of the lumbar section	30,90	7.66	54.14	21.70	40.40	9.35
Torso up chest segment left side	81.30	50.46	112.14	67.20	90.60	12.42
Torso up chest right side segment	69.70	48.29	91.11	63.30	79,50	8.62
Torso up the lumbar section of the left side	112.33	96.36	128,30	105.00	117,00	6.43
Torso up the lumbar section of the right side	114.67	89.54	139,80	103,00	121,00	10.12
Lower limbs up the segment of the left side chest	55.50	43.19	67,81	52,20	61.20	4.96
Lower limbs up the segment of the chest right side	67.50	62.78	72.22	65.40	69.10	1.90
Lower limbs up the left lumbar spine	95.67	-9.06	200.39	47,00	121,00	42.16
Lower limbs up the lumbar segment of the right side	126,00	121,70	130.30	124,00	127.00	1.73

Table 8 Analysis of differences ANOVA for EMG frequency of the rectifier between scoliosis spine, scoliosis and standards groups in girls and boys

Variable	Girls		Boys	
	F	p	F	p
Standing position, the segment of the chest, left a side	0.09	0.91	1.72	0.18
Standing position of the segment right side chest	0.88	0.42	1.70	0.19
Standing position lumbar segment of the left side	0.13	0.88	0.82	0.44
Standing position lumbar section right side	0.96	0.39	2.27	0.11
Lying in front of the chest segment of the left side	1.36	0.26	1.61	0.20
Lying in front of the chest segment of the right side	3.00	0.05	1.58	0.21
Lying on the left side of the lumbar region	0.33	0.72	1.24	0.29
Lying on the right side of the lumbar section	0.70	0.50	2.40	0.09
Torso up chest segment left side	2.61	0.08	0.33	0.72
Torso up chest right side segment	0.06	0.94	**3.44**	**0.04**
Torso up the lumbar section of the left side	0.18	0.84	0.39	0.68
Torso up the lumbar section of the right side	0.24	0.79	0.53	0.59
Lower limbs up the segment of the left side chest	0.76	0.47	0.86	0.43
Lower limbs up the segment of the chest right side	0.76	0.47	0.44	0.64
Lower limbs up the left lumbar spine	0.18	0.83	1.39	0.25
Lower limbs up the lumbar segment of the right side	0.14	0.87	1.47	0.23