Kozyavkin V I, Kozyavkina O V, Kozyavkina N V, Gordiyevych M S, Lysovych V I, Voloshyn T B, Zukow W, Popovych I L. Estimation of effectivenes of spine biomechanical correction Kozyavkin method (INRS) in children with spastic form of Cerebral Palsy. Journal of Education, Health and Sport. 2015;5(2):208-217. ISSN 2391-8306. DOI: 10.5281/zenodo.16046
http://ojs.ukw.edu.pl/index.php/johs/article/view/2015%3B5%282%29%3A208-217
https://pbn.nauka.gov.pl/works/545791
http://dx.doi.org/10.5281/zenodo.16046
Formerly Journal of Health Sciences. ISSN 1429-9623 / 2300-665X. Archives 2011 – 2014 http://journal.rsw.edu.pl/index.php/JHS/issue/archive

Deklaracja.
Specyfika i zawartość merytoryczna czasopisma nie ulega zmianie.
Zgodnie z informacją MNiSW z dnia 2 czerwca 2014 r., że w roku 2014 nie będzie przeprowadzana ocena czasopism naukowych; czasopismo o zmienionym tytule otrzymuje tyle samo punktów co na wykazie czasopism naukowych z dnia 31 grudnia 2014 r.
The journal has had 5 points in Ministry of Science and Higher Education of Poland parametric evaluation. Part B item 1089. (31.12.2014).

The authors declare that there is no conflict of interests regarding the publication of this paper.
Received: 20.10.2014. Revised 18.01.2015. Accepted: 25.02.2015.

ESTIMATION OF EFFECTIVENES OF SPINE BIOMECHANICAL CORRECTION KOZYAVKIN METHOD (INRS) IN CHILDREN WITH SPASTIC FORM OF CEREBRAL PALSY

VI KOZYAVKIN[1], OV KOZYAVKINA[1], NV KOZYAVKINA[1], MS GORDIYEVYCH[1], VI LYSOVYCH[1], TB VOLOSHYN[1], W ŻUKOW[2], IL POPOVYCH[3,1]

[1]International Clinic of Rehabilitation, Truskavets', Ukraine
center@reha.lviv.ua
[2]Faculty of Physical Education, Health and Tourism, Kazimierz Wielki University, Bydgoszcz, Poland
w.zukow@ukw.edu.pl
[3]OO Bohomolets' Institute of Physioilogy National Academy of Sciences, Kyiv, Ukraine
i.popovych@biph.kiev.ua

Abstract

It is presented results of clinical-physiological observations in 108 children (girls and boys equally) aged 4÷17 years with spastic forms of cerebral palsy. State of Gross Motor Function was 1÷4 levels at GMFCS, the functional state of the hand was 1÷3 levels at MACS. Firstly carried out for both handes Dynamometry, Box and Block Test and Nine Hole Peg Test before and after one spine biomechanical correction Kozyavkin method (INRS) (in 54 children) or its imitation (in 54 children). Then children of first group received two-week course of rehabilitation by INRS while children of second (control) group received usual treatment. In children of control group were detected small but significance changes in Box and Block Test: increase by 12,0±1,7% right and by 9,1±1,7% left, while changes in Nine Hole Peg Test as well as in Dynamometry were insignificance (by +4,1±2,2% and -5,8±6,0% right and by +3,9±2,6% and -2,3±4,8% left correspondingly). Therefore then these children received course of rehabilitation by INRS also and analyse of results conducted for united group (108 children). It is detected increase in Box and Block Test by 22,9±2,2% right and by 19,1±1,3% left, in Nine Hole Peg Test by 16,7±1,9% right and by 18,8±1,8% left, in Dynamometry by 30,6±5,0% right and by 31,6±6,1% left. In total effectivenes of spine biomechanical correction Kozyavkin method makes average 23,3±1,6% versus 3,5±1,4% in control.

Keywords: **Cerebral palsy, Dynamometry, Box and Block Test, Nine Hole Peg Test, Intensive Neurophysiological Rehabilitation by Kozyavkin method (INRS), effectivenes.**

****

INTRODUCTION

Earlier we communicated that in children with spastic forms of cerebral palsy after two-week course of rehabilitation by spine biomechanical correction method Kozyavkin (INRS) reducing neural component of muscle tone (N), registered device Neuroflexor, stated in 79,3% cases from 7,6±1,0 by 6,0±0,8, in 13,8% cases changes were not detected and in 2 children only it increased. Multiple regression equation to calculate the expected value of N as after the first correction of the spine, and after a two-week course of rehabilitation method Kozyavkin. The method of

discriminant analysis revealed that the nature of emergency response N at correcting the spine is projected for a range of initial parameters to within 72,4% and accuracy of predictions on the nature of the reaction of N treatment is 93,1% [9].

In this paper we present the results of estimation of effectivenes of spine biomechanical correction Kozyavkin method in children with spastic forms of cerebral palsy using Dynamometry, Box and Block Test and Nine Hole Peg Test.

MATERIAL AND METHODS

The object of clinical-physiological observations were 108 children (55 girls and 53 boys) aged 4÷17 years with spastic forms of cerebral palsy (spastic tetraparesis in 52, hemiparesis in 33, diparesis in 15 children, besides that in 4 diagnosed distonic as well as in 4 diskinetic forms). State motor development at Gross Motor Function Classification System (GMFCS) [1,4,12,14,17] the majority was on the second level (I in 28, II in 39, III in 25, IV in 16 children). Functional status of the hand with Manual Ability Classification Scale (MACS) [3] was in the majority at the second level (I in 7, II in 66, III in 35 children).

The estimation of hand function carried out by Dynamometry, Box and Block Test and Nine Hole Peg Test.

To measure the strength of the hand we used dynamometer of "Jamar" company. In the study the patient is sitting on chair, or with good fixation on the mother's knees. The hand, which perform measurements, reduced to the torso, arms along the body, elbow bent at right angles, is on the anvil. The instructor explains and demonstrates correct assignment. Conducted 2-3 attempts to adapt and understanding of the task on each hand. Hand Dynamometer Norms Mean Strength of Grip taked from Lafayette Instrument Hand Dynamometer User instructions [10].

Box and Block Test is a simple, reliable and valid test of hand function. It is widely used by specialists in physical rehabilitation and ergotherapy. This test was developed in 1985 Mathiowetz V et al. [11] to assess hand function in adults with cerebral palsy. The essence of the test is to determine the number of wooden cubes that patient can shift from one box to the second in a minute. For the test requires a wooden box divided into two parts by a partition height of 15 cm. One half of the box is 150 wooden blocks measuring 1 inch (2,5 cm). Patient explain and show how to rearrange blocks. At the command as soon as the patient begins to shift blocks from one box to the other half. Instructor captures a patient and stops after one minute. First, examine the dominant hand, then rearrange blocks in place and inspect second hand. Registers the number of translated blocks each hand. Time test three to five minutes. Average Performance of Normal Subjects taked from Mathiowetz V et al. [11] (Fig. 1).

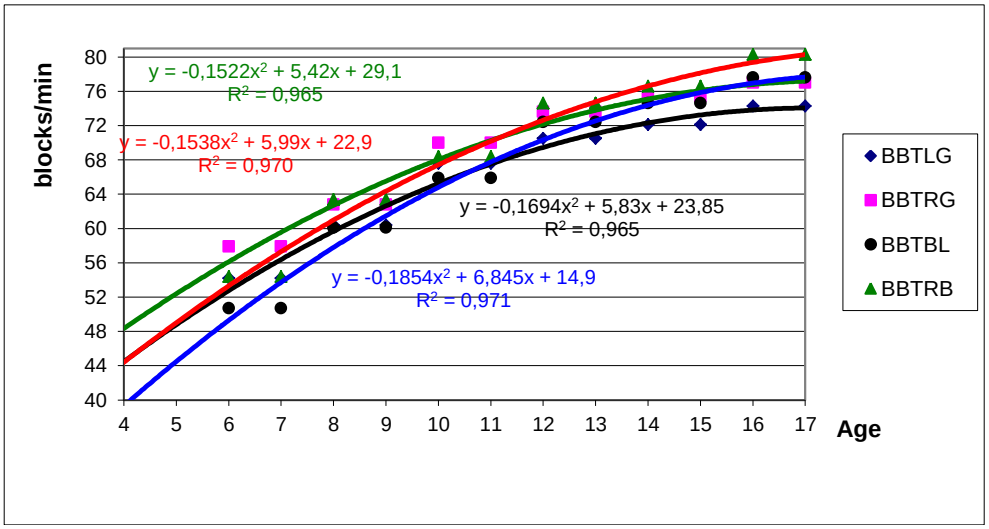

Fig. 1. Average Performance of Normal Girls (G) and Boys (B) on the Box&Block Test (BBT) for Left (L) and Right (R) Hand [11], with our extrapolation for children 4-5 Years

The essence of Nine Hole Peg Test [15] is to determine how long the patient can turn each hand insert and then remove wooden 9 pegs in 9 holes in the wooden bar. Before the test ergotherapist shows the patient how to do it. At the command as soon as the patient begins to insert wooden plugs into the holes in the wooden bar. Instructor intersect

time. At first examined the dominant hand, then the other. Average Performance of Normal Subjects taked from Wang YC et al. [18].

For each test we calculated Laterality Index (LI) using the equation [13]:

LI=100%•(Right - Left)/0,5•(Right + Left)

Registration of functional indices held three times: on admission to the clinic, 10-15 minutes after the first spine biomechanical correction method Kozyavkin or it imitation and after a two-week rehabilitation course by method Kozyavkin [6-8] or usual method.

A changes was calculated as differences between personal indices after one or course manipulation and initial indices (Urgent and Course effects correspondingly). Effects expressed tradicionally in Percent using the equation [13]:

Effect, %=100%•(After-Before)/0,5•(After+Before)

In addition we calculated deviation of personal Indices from Norm in Euklidian Units (d) using the known equation:

d=(Variable - Norm)/Norm•Coefficient Variation.

Digital material is treated by methods variation, cross-correlation and discriminant analyses with the use of package of softwares "Statistica-5.5" and algorithm of Truskavets' scientific school of balneology [16].

RESULTS AND DISCUSSION

Control and basic (Kozyavkin) group formed in such a way that starting positions: sex, age, GMF and MACS - were the same. Sex Index (Girls=1, Boys=0) in Control group (n=54) was 0,52±0,07, in Kozyavkin group (n=54) 0,51±0,05, mean age 7,4±0,4 and 7,9±0,3 years correspondingly, GMF level 2,3±0,1 and 2,4±0,1 points correspondingly, MACS level 2,2±0,1 2,2±0,1 points correspondingly.

Detected (Table 1) that in Control group after first manipulation Index of Dynamometry for Right Hand somewhat reduced, and for Left Hand nonsignificant reduction. After a course of conventional therapy Indices of Dynamometry no different from the initial. Note the leveling Natural Right Laterality, which also remained unchanged.

Table 1. Indices of Dynamometry and its absolute changes after first manipulation and after course rehabilitation in children of Control group and Kozyavkin group

Indices of Dynamo-metry	Parame-ters	Control group n=54	Kozyavkin group n=108	t CK group	p CK group
Right Hand, kg	MN±m	12,2±1,1	12,4±0,6	-	-
	MI±m	20,6±1,6#	18,8±1,4#	0,84	-
	MU±m	19,4±1,5#	20,5±1,3#	0,55	-
	EU±m	-1,2±0,5*	+1,7±0,5*	4,10	<0,001
	%EU±m	-6,5±2,5*	+17,7±4,5*	4,70	<0,001
	MC±m	19,7±1,4#	23,6±1,5#	1,90	>0,05
	EC±m	-0,9±1,0	+4,8±0,7*	4,67	<0,001
	%EC±m	-2,3±4,8	+30,6±5,0*	4,75	<0,001
Left Hand, kg	MN±m	11,3±1,0	11,6±0,5	-	-
	MI±m	20,3±1,6#	20,0±1,4#	0,14	-
	MU±m	19,3±1,6#	20,6±1,3#	0,63	-
	EU±m	-1,0±0,7	+0,6±0,5	1,86	>0,05
	%EU±m	-6,2±3,8	+13,3±5,5*	2,92	<0,01
	MC±m	19,8±1,7#	24,1±1,5#	1,90	>0,05
	EC±m	-0,5±0,8	+4,1±0,8*	4,07	<0,001
	%EC±m	-5,8±6,0	+31,6±6,1*	4,37	<0,001
Laterality Index, %	MN±m	+6,8±0,2	+6,6±0,1	-	-
	MI±m	+1,8±7,0	-4,0±7,8	0,55	-
	MU±m	+0,3±7,6	-0,5±7,3	0,08	-
	EU±m	-1,5±4,3	+3,5±3,5	0,90	-
	MC±m	+3,4±8,0	-7,0±6,6	1,00	-
	EC±m	+1,6±5,5	-2,9±5,8	0,56	-

Foot-notes. MN – Mean Norm; MI – Mean Initial (significantes deviations from marked#); MU – Mean Urgent (after first manipulation); EU – Effect Urgent (changes after first manipulation, significantes marked*); MC – Mean Course (after course rehabilitation); EC – effect course (changes after course rehabilitation).

Indices of Box & Block Test (Table 2) after first imitation of correction slightly but statistically significantly increased, and more for Right Hand, so Laterality Index significantly shifted to the right, without reaching yet the norm. After a course of conventional therapy Indices of Box & Block Test grow even more. Since the first 10 children tested were unable to fulfill Nine Hole Peg Test one or both hands, with the aim of quantitative evaluation, we calculated the inverse of the test, so the Index of Inversely Nine Hole Peg Test (in 10^3/sec) was in these cases 0.

Table 2. Indices of Box & Block Test and its absolute changes after first manipulation and after course rehabilitation in children of Control group and Kozyavkin group

Indices of Box & Block Test	Parame-ters	Control group n=54	Kozyavkin group n=108	t CK group	p CK group
Right Hand, blocks/min	MN±m	58,1±1,4	59,6±0,9	0,90	-
	MI±m	26,5±1,4#	26,9±1,0#	0,23	-
	MU±m	28,6±1,5#	30,2±1,1#	0,86	-
	EU±m	+2,0±0,5*	+3,3±0,3*	2,23	<0,05
	%EU±m	+6,3±2,2*	+13,5±2,3*	2,26	<0,05
	MC±m	30,0±1,6	32,9±1,1	1,49	>0,1
	EC±m	+3,5±0,5*	+6,0±0,4*	3,90	<0,001
	%EC±m	+12,0±1,7*	+22,9±2,2*	3,92	<0,001
Left Hand, blocks/min	MN±m	54,6±1,5	56,2±0,9	0,91	-
	MI±m	27,1±1,4#	27,8±1,0#	0,41	-
	MU±m	28,2±1,5#	31,0±1,1#	1,51	>0,1
	EU±m	+1,2±0,5*	+3,2±0,3*	3,43	<0,001
	%EU±m	+2,7±1,9	+10,3±1,2*	3,38	<0,001
	MC±m	29,6±1,4#	33,5±1,1#	2,19	<0,05
	EC±m	+2,5±0,4*	+5,7±0,4*	5,66	<0,001
	%EC±m	+9,1±1,7*	+19,1±1,3*	4,64	<0,001
Laterality Index, %	MN±m	+6,7±0,4	+6,2±0,2	1,12	-
	MI±m	-2,7±3,8#	-6,1±3,2#	0,68	-
	MU±m	+0,9±3,6	-4,1±2,9#	1,08	-
	EU±m	+3,6±1,8*	+2,0±1,3	0,72	-
	MC±m	+0,3±4,0	-3,5±2,8#	0,78	-
	EC±m	+2,9±1,8	+2,6±1,5	0,13	-

Table 3. Indices of Inversely Nine Hole Peg Test and its absolute changes after first manipulation and after course rehabilitation in children of Control group and Kozyavkin group

Indices of Inversely Nine Hole Peg Test	Parame-ters	Control group n=54	Kozyavkin group n=108	t CK group	p CK group
Right Hand, 10^3/sec	MN±m	45,8±1,3	47,9±0,8	1,38	>0,1
	MI±m	20,4±1,3#	20,5±1,1#	0,06	-
	MU±m	21,4±1,3#	21,7±1,1#	0,18	-
	EU±m	+1,0±0,4*	+1,3±0,3*	0,60	-
	%EU±m	+5,8±2,1*	+7,8±1,6*	0,76	-
	MC±m	21,2±1,3#	23,6±1,2#	1,36	>0,1
	EC±m	+0,8±0,4	+3,2±0,4*	4,24	<0,001
	%EC±m	+4,1±2,2	+16,7±1,9*	4,33	<0,001
Left Hand, 10^3/sec	MN±m	42,7±1,3	45,1±0,8	1,57	>0,1
	MI±m	19,0±1,3#	19,7±0,9#	0,44	-
	MU±m	20,4±1,3#	21,7±1,0#	0,79	-
	EU±m	+1,4±0,4*	+1,9±0,3*	1,00	-
	%EU±m	+8,0±2,2*	+9,8±1,7*	0,65	-
	MC±m	19,7±1,2#	23,3±1,0#	2,30	<0,05

	EC±m	+0,6±0,4	+3,6±0,3*	6,00	<0,001
	%EC±m	+3,9±2,3	+18,8±1,8*	5,10	<0,001
Laterality Index, %	MN±m	+7,7±0,6	+6,5±0,3	1,78	>0,05
	MI±m	+3,0±9,9	-3,1±7,4	0,49	-
	MU±m	+1,3±9,5	-4,7±7,2	0,50	-
	EU±m	-1,7±2,0	-1,7±1,6	0	-
	MC±m	+2,7±9,8	-4,9±6,8	0,64	-
	EC±m	-0,3±2,3	-1,9±1,8	0,55	-

Indices of Inversely Nine Hole Peg Test (Table 3) after first imitation of correction slightly but statistical significantly increased, and more for Left Hand. However, after a course of conventional therapy Indices of Inversely Nine Hole Peg Test showed only a tendency to increase.

Overall, urgent effect imitation of correction was +1,7±1,2%, and the effect of traditional therapy course: +3,5±1,4% (p<0,02). Considering this, we immediately had a course of therapy for these children by using Kozyavkin.

Preliminary analysis revealed no significant differences regarding both urgent and exchange rate effects on functional indices of both hands, so the final statistical treatment of the two groups were combined.

Revealed that after the first manipulation by Kozyavkin method Indices of Dynamometry significantly increased, this effect was more tangible after a course of rehabilitation (Table 1). Indices of Box & Block Test after the first correction Kozyavkin method were increased significantly compared to its tangible imitation. It notes also the cumulative effects of course manipulation (Table 2). Urgent effect Kozyavkin method on Indices of Inversely Nine Hole Peg Test not significantly higher than the control, whereas after a course of rehabilitation effectiveness of the manifested significantly (Table 3). Unfortunately, recovery rightsided lateralization not happened for any test. Overall Urgent effect Kozyavkin method is +12,1±1,6%, and Course effect +23,3±1,6%.

Table 4. Z-scores of Hand Functions before and after first manipulation as well as after course rehabilitation in children of Control group and Kozyavkin group

Indices	Parame-ters	Control group n=54	Kozyavkin group n=108	Diffe-revce	t CK	p CK
Dynamometry Right Hand	MI±m	+2,35±0,39	+1,44±0,26	-0,91	1,94	>0,05
	MU±m	+2,02±0,34	+1,84±0,25			
	EU±m	-0,33±0,12*	+0,40±0,11*	+0,73	4,48	<0,001
	MC±m	+2,10±0,32	+2,54±0,28			
	EC±m	-0,24±0,26	+1,11±0,18*	+1,35	4,27	<0,001
Dynamometry Left Hand	MI±m	+2,36±0,36	+1,97±0,29	-0,39	0,84	-
	MU±m	+2,15±0,35	+2,12±0,28			
	EU±m	-0,21±0,15	+0,15±0,12	+0,36	1,87	>0,05
	MC±m	+2,24±0,37	+2,86±0,30			
	EC±m	-0,12±0,20	+0,89±0,18*	+1,01	3,75	<0,001
Box & Block Test Right Hand	MI±m	-5,49±0,27	-5,72±0,20	-0,23	0,68	-
	MU±m	-5,10±0,31	-5,15±0,20			
	EU±m	+0,39±0,10	+0,57±0,06*	+0,18	1,54	>0,1
	MC±m	-4,88±0,31	-4,67±0,20			
	EC±m	+0,61±0,10*	+1,05±0,08*	+0,44	3,44	<0,001
Box & Block Test Left Hand	MI±m	-4,81±0,30	-4,89±0,16	-0,08	-	-
	MU±m	-4,57±0,34	-4,33±0,18			
	EU±m	+0,24±0,10*	+0,56±0,06*	+0,32	2,74	<0,01
	MC±m	-4,32±0,33	-3,88±0,18			
	EC±m	+0,48±0,09*	+1,01±0,07*	+0,53	4,65	<0,001
Inversely Nine Hole Peg Test Right Hand	MI±m	-3,53±0,22	-3,66±0,15	-0,13	-	-
	MU±m	-3,39±0,22	-3,49±0,15			
	EU±m	+0,14±0,05*	+0,17±0,04*	+0,03	0,47	-
	MC±m	-3,41±0,22	-3,23±0,16			
	EC±m	+0,12±0,06*	+0,43±0,05*	+0,31	3,97	<0,001
Inversely Nine	MI±m	-3,73±0,25	-4,01±0,15	-0,28	0,96	-

Hole Peg Test Left Hand	MU±m EU±m MC±m EC±m	-3,51±0,25 +0,22±0,07* -3,64±0,25 +0,09±0,07	-3,70±0,17 +0,31±0,06* -3,44±0,16 +0,57±0,05*	 +0,09 +0,48	 0,98 5,58	 - <0,001
In Total	MI±m MU±m EU±m MC±m EC±m	-2,16±0,23 -2,08±0,24 +0,07±0,05 -2,00±0,23 +0,16±0,06*	-2,48±0,14 -2,12±0,14 +0,36±0,04* -1,64±0,15 +0,84±0,06*	-0,32 +0,29 +0,68	1,19 4,53 8,01	- <0,001 <0,001

To perform a quantitative evaluation of the integral functional state hands in three tests, expressed in different units, you must first bring them to a "common denominator", in other words, expressed in the same scale. We [16] as [2], propose to achieve this by converting indices in Euklidian Units (Z-scores) (Table 4, Fig. 2). It was found that the maximum is reduced Box & Block Test Right Hand, instead Indices of Dynamometry even exceed the age and sex ratios. Least to correct Indices of 9-HPT.

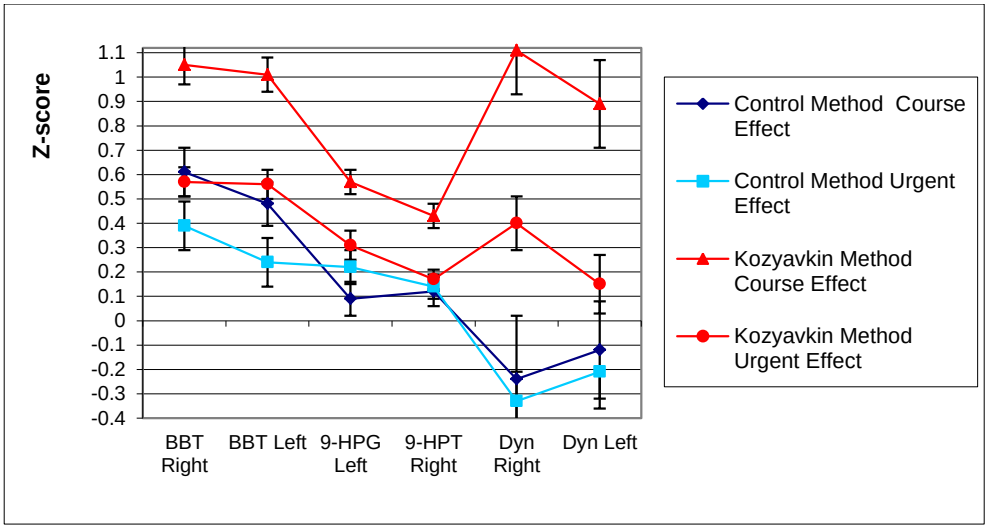

Fig. 2. Urgent and Course Effects of Control and Kozyavkin methods on Hand Function Tests in Children

In order to identify the kind of functional indices, the collection of which significantly differing states of the hands before and after handling and one of the course was held Discriminant Analysis (method Forward Stepwise [5]). Revealed that there are only two distinctive Indices of Left Hand (Tables 5-7).

Table 5. Discriminant Function Analysis Summary.
Step 2, N of variables in model: 2; Grouping: B, C, K
Wilks' Lambda: 0,931; approx. $F_{(4,64)}$=5,84; p<0,0001

Variables currently in the model	Wilks' Λ	Partial Λ	F-remove (2,32)	p-level	Tolerancy	F to enter	p-level	Λ	F-value	p-level
Box & Block Test Left	,970	,960	6,70	,001	,268	9,84	10^{-4}	,942	9,84	10^{-4}
Inv. Nine Hole Peg Test Left	,942	,988	1,96	,142	,268	1,96	,142	,931	5,84	10^{-3}

Variables currently not in the model	Wilks' Λ	Partial Λ	F to enter	p-level	Tolerancy	χ^2 Tests with Successive **R**oots **R**emoved					
Dynamometry Right	,927	,996	,667	,514	,821	**RR**	λ	r*	Λ	χ^2	p
Dynamometry Left	,928	,997	,438	,646	,721	0	,068	0,25	,931	23,0	10^{-4}
Box & Block Test Right	,927	,996	,720	,487	,393	1	,006	0,08	,994	1,9	0,169
Dynamometry Laterality	,929	,998	,332	,717	,923	**Squared Mahalanobis Distances**					
Box & Block Test Laterality	,928	,997	,516	,597	,926	Before-Conrol: 0,133 (F=2,7; p=0,069)					
Inv. Nine Hole Peg Test Later.	,930	,999	,119	,888	,837	Before-Kozyavkin: 0,334 (F=10,8; $p<10^{-4}$)					
Inv. Nine Hole Peg Test Right	,930	,999	,179	,836	,660	Control-Kozyavkin: 0,121 (F=2,2; p=0,12)					

Table 6. Standardized, Structural and Raw Coefficients and Constants for Canonical Variables

Variables currently in the model	Standardized Co-eff. for Canonical Variables		Correlations Variables - Canonical Roots		Raw Coefficients for Canonical Variables	
	Root 1	Root 2	Root 1	Root 2	Root 1	Root 2
Box & Block Test Left	-1,488	1,232	-0,94	-0,33	-0,142	0,118
Inv. Nine Hole Peg Test Left	0,635	-1,825	-0,64	-0,77	65,665	-188,55
Discriminant Properties	92%	8%	**Constants**		2,875	0,411

Table 7. Coefficients and Constants for Classification Functions as well as Means all groups

Variables currently in the model	Before Reha-bilitation	Control Group	Kozyavkin Group
Box & Block Test Left	0,322	0,389	0,402
Inv. Nine Hole Peg Test Left	-90,211	-147,116	-124,621
Constants	-4,252	-6,121	-6,366
Box & Block Test Left	**27,6±1,1**	**29,6±1,4**	**33,5±1,1**
Inv. Nine Hole Peg Test Left	**19,5±1,0**	**19,7±1,2**	**23,3±1,0**

The calculation Means of Canonical Variables using Raw Coefficients and Constants for Canonical Variables (Table 6) allow visualization characteristic (peculiar) states Children before rehabilitation and after course rehabilitation by Control and Kozyavkin methods (Fig. 3).

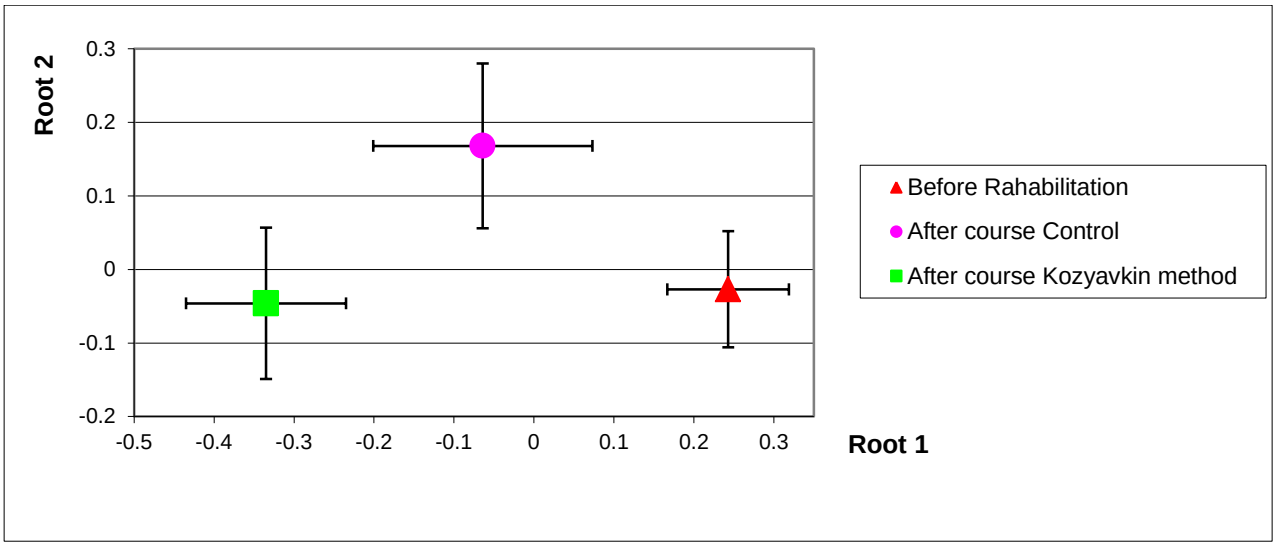

Fig. 3. Means of Canonical Variables for Children before rehabilitation and after course rehabilitation by Control and Kozyavkin methods

Considerable practical interest is finding out to predict the effect of therapy on the first correction effect. Correlation analysis shows that it is in principle possible (Fig. 4).

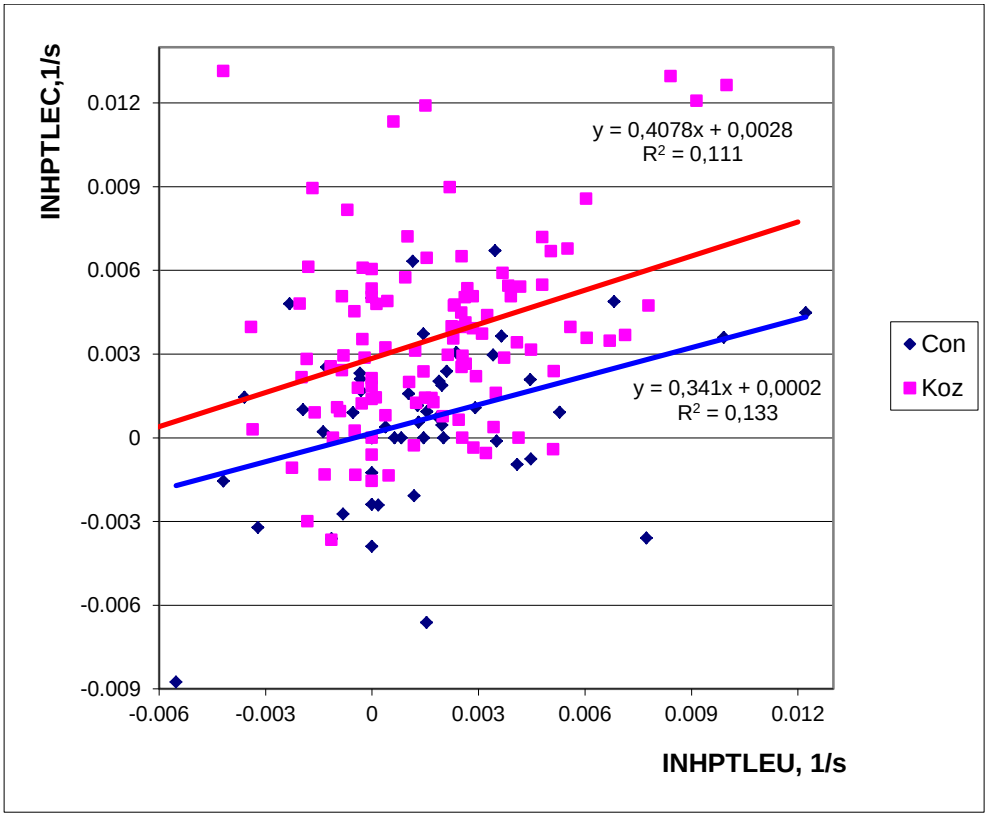

Fig. 4. Relationships between urgent (axis X) and course (axis Y) changes in Inversely Nine Hole Peg Test of Left Hand of Children of Control and Kozyavkin groups

Moreover, the difference between the two regression equations can predict the net-effect course rehabilitation Kozyavkin method for urgent net-effect of first correction (Fig. 5).

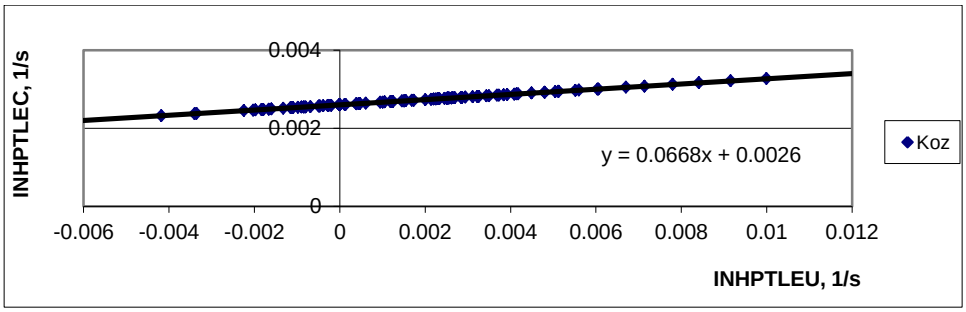

Fig. 5. Relationships between urgent (axis X) and course (axis Y) changes in Inversely Nine Hole Peg Test of Left Hand of Children of Kozyavkin group deducting results of Control group

It is important that even decline index of Inversely Nine Hole Peg Test of Left Hand after first correction predictes its slight increase after course rehabilitation, not to mention the positive urgent effect correction. The same applies to changes in all three tests in general (Fig. 6 and 7).

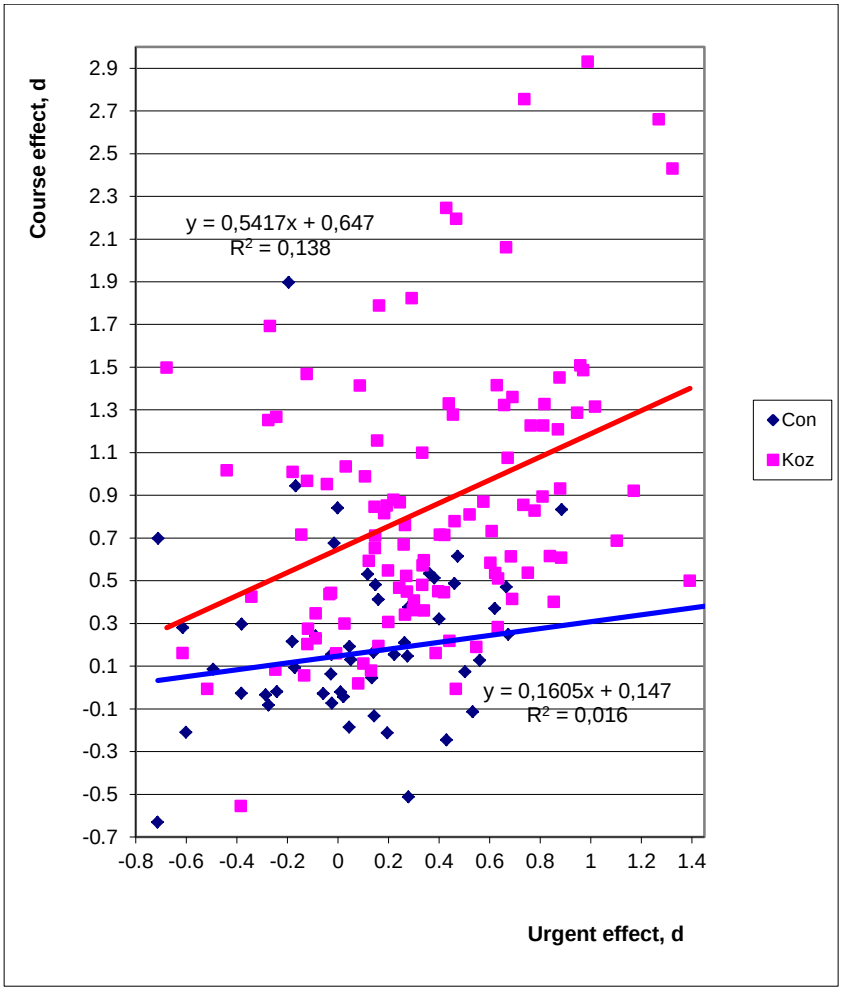

Fig. 6. Relationships between total urgent (axis X) and course (axis Y) changes in Indices of Children of Control and Kozyavkin groups

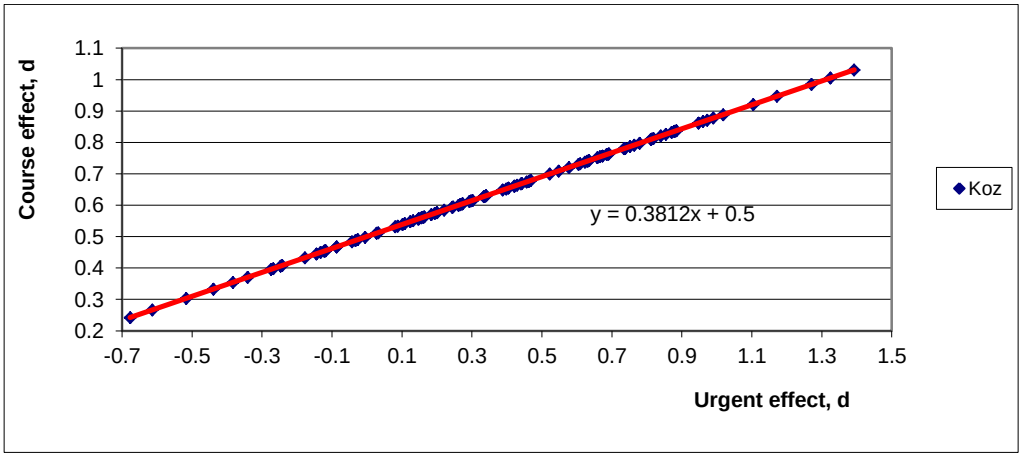

Fig. 7. Relationships between total urgent (axis X) and course (axis Y) changes in Indices of Children of Kozyavkin group deducting results of Control group

So, spine biomechanical correction Kozyavkin method (INRS) significantly improves Hand Functions, thus Course effect can be provided for Urgent effect.

REFERENCES

1. Bodkin AW, Robinson C, Perales FP. Reliability and Validity of the Gross Motor Function Classification System for Cerebral Palsy // Pediatric Physical Therapy.- 2003.- P. 247-252.
2. Cook IA, O'Hara R, Uijtdehaage SH, Mandelkern M, Leuchter AF. Assessing the accuracy of topographic EEG mapping for determining local brain function // Electroencephalogr Clin Neurophysiol.-1998.-107(6).- P. 408-414.
3. Eliasson AC, Krumlinde SL, Rösblad B, Beckund E, Arner M, Öhrvall AM, Rosenbaum P. The Manual Ability Classification System (MACS) for children with cerebral palsy: scale development and evidence of validity and rehability // Dev Med Child Neur.-2006.-48.- P. 549-554.
4. Gross Motor Function Classification System (GMFCS). - MacMaster University.-http://www.canchild.ca/en/ measures/ gmfcs.asp.
5. Klecka WR. Discriminant analysis (Seventh printing, 1986) // Factor, discriminant and cluster analysis. - M.: Finansy i statistica, 1989.- P. 78-138.
6. Kozyavkin method as System of Intensive Neurophysiological Rehabilitation [in Ukrainian] / Ed. Kozyavkin VI. - L'viv: Designe-Studio Papuga, 2011.- 240 p.
7. Kozyavkin VI. Basics of Intensive Neurophysiological Rehabilitation // II International symposium "Cerebral Palsy Syndrome: Treatment Methods and Research on Effectiveness".- Book of Abstracts.-Truskavets', 2010.-P. 15-18.
8. Kozyavkin VI., Sak NM., Kachmar OO., Babadagly MO. Basics of Rehabilitation of Motor Disfunctions by Kozyavkin method [in Ukrainian].-L'viv: Ukrainian technologies, 2007.-192 p.
9. Kozyavkin VI., Kozyavkina NV, Kozyavkina OV, Gordiyevych MS, Lysovych VI, Voloshyn TB, Popovych IL**,** Zukow W. Effect of spine biomechanical correction Kozyavkin's method (INRS) on components of muscle tone in children with spastic form of Cerebral Palsy and its possible prediction // Journal of Education, Health and Sport.-2015.-5 (1).- P. 11-30.
10. Lafayette Instrument Hand Dynamometer. User instructions.-10 p.
11. Mathiowetz V, Federman S, Wiemer D. Box and Block Test of Manual Dexterity: Norms for 6-19 Year Olds // Canad J Occup Ther.-1985.-52,No5.- P. 241-245.
12. Morris C and Bartlett D. Gross Motor Function Classification System: impact and utility // Dev Med Child Neur.-2004.-46.- P. 60-65.
13. Newberg AB, Alavi A, Baime M, Pourdehnad M, Santanna J, d'Aquili E. The measurement of regional cerebral blood flow during the complex cognitive task of meditation: a preliminary SPECT study // Psychiatry Research: Neuroimaging Section.-2001.-106.- P. 113-122.
14. Palisano R, Rosenbaum PL, Walter SD et al., Development and Rehability of a System to Classify Gross Motor Function in children with cerebral palsy // Dev Med Child Neur.-1997.-39.- P. 214-223.
15. Poole JL, Burtner PA, Torres TA, McMullen CK, Markham A, Marcum ML, Anderson JB, Qualls C. Measuring Dexterity in Children using the Nine Hole Peg Test // J Hand Ther.-2005.-18(3).-P. 348-351.
16. Popovych IL. Stresslimiting adaptogene mechanism of biological and curative activity of bioactive water Naftussya [in Ukrainian].-K.: Computerpress, 2011.-300 p.
17. Russell DJ, Avery LM, Walter SD, Hanna SE, Bartlett DJ, Rosenbaum PL, Palisano RJ, Gorter JW. Development and validation of item sets to improve efficiency of administration of the 66-item Gross Motor Function Measure in children with cerebral palsy // Dev Med Child Neur.-2010.-52,No2.- P. 48-54.
18. Wang YC, Magasi SR, Bohannon RW, Reuben DB, McCreath HE, Bubela DJ, Gershon RC, Rymer WZ. Assessing Dexterity Function: A Comparison of Two Alternatives for the NIH Toolbox // J Hand Ther.-2011.-24(4).-P. 313-321.