Globethics Repository



Research on the effectiveness of therapy used for children with grapho-motor problems applying the authorial grapho-motor questionnaire

This page was generated automatically upon download from the Globethics Repository. More information on Globethics see https://www.globethics.net. Data and content policy of Globethics Repository see https://repository.globethics.net/pages/policy.

Item Type	Article
Authors	Szmalec, Jacek
Publisher	Dialogo / Research Center on the Dialogue between Science & Theology (Romania)
Rights	© 2014 RCDST. All rights reserved.
Download date	2026-11-15 09:15:27
Link to Item	http://hdl.handle.net/20.500.12424/3978192

DIALOGO - International Journal of the Proceedings of the Conferences on the Dialogue between Science and Theology

Volume 3 | Issue 2 Article 4

2017

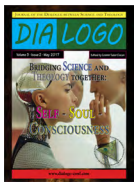
Research on the effectiveness of therapy used for children with grapho-motor problems applying the authorial grapho-motor questionnaire

Jacek Szmalec
Kazimierz Wielki University, Poland jszmalec@gmail.com

Follow this and additional works at: ***http://dialogo-conf.com/archive***
Copyright © 2014, RCDST (Research Center on the Dialogue between Science & Theology), Romania. All rights reserved

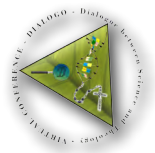
Recommended Citation
Szmalec, Jacek, "Research on the effectiveness of therapy used for children with grapho-motor problems applying the authorial grapho-motor questionnaire," Proceedings DIALOGO (DIALOGO-CONF 2017 SSC), DOI: 10.18638/dialogo.2017.3.2.4, ISBN: 978-80-554-1338-9 ISSN: 2393-1744, vol. 3, issue 2, pp. 50-64, 2017
Available at: http://www.dx.doi.org/10.18638/dialogo.2017.3.2.4

This work is licensed under a Creative Commons Attribution-Noncommercial-Share Alike 4.0 International License



DIALOGO
CONFERENCES & JOURNAL
journal homepage: http://dialogo-conf.com

This paper was presented in the
Bridging Science and Religion together: SELF - SOUL - CONSCIOUSNESS. (DIALOGO-CONF 2017 SSC)
held online, on the Journal's website,
from May 19 - 26, 2017



Research on the effectiveness of therapy used for children with grapho-motor problems applying the authorial grapho-motor questionnaire

Jacek Szmalec
Kazimierz Wielki University
cooperation with Special Education Unit
Bydgoszcz, POLAND
jszmalec@gmail.com

ARTICLE INFO

Article history:
Received 25 April 2017
Received in revised form 10 May
Accepted 15 May 2017
Available online 30 May 2017
doi: 10.18638/dialogo.2017.3.2.4

Keywords:

upper limb development; school readiness; grapho-motor problems; identification of causes; questionnaires; therapy; therapy efficiency in statistical approach;

ABSTRACT

Proper physical development of the upper limb proceeds according to repetitive for every human sequence. Despite this fact, due to various reasons hand does not function properly. It is especially visible when it comes graphomotor problems of children aged six and seven. Causes of their problems may be identified by using one of two independent questionnaires. Conclusions based on answers delivered as a part of these questionnaires allow planning therapy. Its efficiency was examined and subjected to statistical analysis.

© 2014 RCDST. All rights reserved.

I. INTRODUCTION

'The hand manifests a high movability and susceptibility. These features enable it to adjust to various kinds of objects shapes, which it has to grab. Hand is a unique tool used to complete tasks not only during our every-day home, professional, recreational activities, but also in music and arts, it is also used to communicate' [4]

'Hand enables close connection with other people through the sense of touch. Abundance of receptors in skin of a hand surface differentiates a hand from other areas of a body. It is different due to the fact that hand may touch and may be touched at the same time' [4]

II. UPPER LIMB DEVELOPMENT.

Hand, similar as in case of foot, grows earlier than remaining parts of an upper limb (an arm and a forearm. Development of a limb begins in 4th week of fetal life. In about

eISSN: 2393-1744, cdISSN: 2392-9928
printISSN: 2457-9297, ISSN-L 2392-9928
ISBN 978-80-554-1338-9

36th day of pregnancy fingers are formed and between 25th and 28th week, hands of fetus perform instinctive grab reaction. The most intensive growth of a hand is observed between 4th and 5th and 8th and 9th month of pregnancy, and between 9th month of intrauterine life and 1st month of postnatal life, the development of the hand slows down (Marecki 1979) The dynamics of growth and proper development of hand parameters are considerably influenced by external factors, such as: hygienic lifestyle, appropriate eating or proper social and living conditions. As a perfect biomachine the hand constitutes an irreplaceable element of our body. Complex and at the same time subtle anatomy provides huge kinematic and dynamic possibilities. Combination of wide range of moves with sensitivity makes it a perfect grabbing tool created by a nature. [7]

'Hand and wrist contain 27 bones (19 miniature long bones and bones of the wrist).This area comprises 17 joints, including finger joints. Hand has 19 internal muscles and similar number of sinews beginning in a forearm' [4]

Fine motor skills development is contained in complete psychomotor development of a child. Because the baby is born with lowered central tension (area of torso) and proximal body parts (shoulder girdle and pelvic girdle), clearly elevated tension in distal parts. Only when the tension between distal and proximal body parts is rebalanced in the process of development, it is possible to perform free moves in a space [5]

Irregularities in distribution of muscle tension may cause many development problems (e.g. smaller muscle strength, inadequate nervous and muscular answer to a strength of stimulus, muscular imbalance of specific segments of a body), and as a consequence, long lasting development disorders may contribute to occurrence of many school difficulties e.g. irregularities of graphomotor level of child's handwriting [3] In early stage of learning how to write motor functions may be assigned with fundamental meaning. Ability to maintain balance, coordination and fluency of moves allows a child to acquire writing, painting, drawing and cutting skills.

These abilities influence adjustment to school requirements. That is why evaluation of school readiness (despite evaluation of social, cognitive and emotional development) includes also physical development of children, translated into global mobility and manual ability [1]

Motor aspect of ability to write means coordinating moves of the hand – arm, forearm, wrist and fingers.

Bone and muscle system of a child aged 6-7 is not fully developed, that is why in the beginning of learning how to write, the child may encounter difficulties with harmonizing large movements (arm, forearm) and small movements of a hand (palm, wrist, fingers) with a parallel ability to activate appropriate tensions of specific muscle groups – necessity to use a number of small, only insignificantly different movements with constant change of their directions (up, down – elevation and depression) with retaining direction of written text (from left side to the right one – progressive movement) – spatial organization and rhythmicity of handwriting (place of beginning a word, distribution in ruling, maintaining appropriate spaces and letter sizes) [6]

Fine motor skills is mainly related to activities connected with usage of limbs, work of palm fingers, evaluation of their functionality, and their relation to the sense of sight. Any kind of nervous and muscular dysfunctions as a part of fine motor skills system cause irregularities in hold of writing tool, disorder of fingers coordination, palms and forearm, visual-motor coordination, speed of hand movement, aversion to

perform manual tasks, low graphic level of handwriting, lack of precision (in relation to unadjusted muscle tension) and also high fatigability in table works and problems in performing self-service tasks [2]

Many researchers have studied graphomotor problem, and basing on observations, there were prepared questionnaires to evaluate graphomotor skills of a child. One of them is graphomotor skill profile, prepared by Domagała, Mirecka. Graphomotor skill profile was designed as a tool to recognize possibilities and limitations in area of graphomotor skills among examined persons, basing on analysis of gathered samples of handwriting and character-like patterns and on observation of progress of graphomotor activities together with the measurement of its pace. The evaluation of handwriting level embraces two aspects: creations of graphomotor activities, technique of graphomotor activities. Another diagnostic tool is SOS (Systematische Opsporing Schrijfproblem – methodical recognition of handwriting problems). The tool was developed in 1999, as an answer for a demand of teachers, who had not had a sufficient, easy tool, to assess handwriting and recognize children with handwriting problems. The author of the tool is Bouwien Smits-Engelsman in cooperation with Ingrid Vernken, Marjo Stevens and Algerem van Hagen.[8]

III. Identification of causes for graphomotor problems and suggested therapy.

Basing on mentioned literature and own experience, in order to easily capture occurrence of child's graphomotor problems the author designed 'Graphomotor questionnaire – short version'. The task of the respondent is to answer 10 questions listed below by marking 'Yes' or 'No' with an X mark in the corresponding field.

Graphomotor questionnaire – short version

No.	Observations	Yes	No
1.	While walking on the flat, horizontal surface is the child able to remain in a straight position?		
2.	Can the child dress independently?		
3.	Is there visible a symmetrical weight distribution on buttocks during writing?		
4.	Is there visible forearm rotation during writing?		
5.	Is the child, during writing, able to adjust pressure strength to a writing tool?		
6.	Is there neck of a child visible during writing?		
7.	Is there visible stabilization of a notebook with the second hand of a child?		
8.	Can the child keep-up with writing down text from the blackboard?		
9.	Is there visible pointing finger activity during writing?		
10.	Is the child able to write within the boundaries of ruling?		

If the answers to at least 5 questions were 'no', in order to identify causes of graphomotor problems, author recommends using prepared graphomotor questionnaire in expanded version 'Hand therapy – questionnaire for a parent or a teacher.'

HAND THERAPY – QUESTIONNAIRE FOR A PARENT OR A TEACHER

Questionnaire author:

doi: 10.18638/dialogo.2017.3.2.4

HAND THERAPY – QUESTIONNAIRE FOR A PARENT OR A TEACHER			
Questionnaire author: **Jacek Szmalec**	NAME	SURNAME	SURVEY DATE
	NAME	SURNAME OF A CHILD	AGE
DIAGNOSIS	ASPERGER SYNDROME [Y/N]		
	RETT SYNDROME [Y/N]		
	HYPERKINETIC DISORDER [Y/N]		
	INFANTILE AUTISM [Y/N]		
	ATYPICAL AUTISM [Y/N]		
	ATYPICAL PSYCHOMOTOR DEVELOPMENT [Y/N]		
DEVELOPMENT HISTORY	HAS THE CHILD, RIGHT AFTER BIRTH, BEEN ABLE TO GET OUT OF THE SWADDLE WRAP [MONTH]		
	IN WHICH MONTH THE CHILD WAS ABLE TO DO PIVOTS [MONTH]		
	DID THE CHILD LIKE TO LIE ON ITS BELLY [Y/N]		
	IN WHICH MONTH THE CHILD BEGAN TO SIT [MONTH]		
	FOR HOW LONG (UP TO 6TH MONTH) CHILD WAS ABLE TO LAST WITHOUT CRYING WHILE LYING ON ITS BELLY – SHORT DESCRIPTION		

No.	QUESTION (Mark the best answer with an X)	Always 3 pkt.	Freq. 2 pkt.	Sometimes 1 pkt.	Never 0 pkt.
1.	Does the child, while doing its homework, take a following position:				
	A. Standing?				
	B. Lying?				
2.	Does the child bend its feet around chair legs?				
3.	Is there a visible asymmetrical position of pelvis while child sits on a chair?				
4	Does the child shift the body weight balance on one of the buttocks?				
5.	Is the child satisfied with the pace of its handwriting?				
6.	Is there a visible asymmetrical position of shoulders?				
7.	Does the child, while writing, start movement from shoulder girdle?				
8.	Observation of child while it walks:				
	A. does the child shuffle its feet?				
	B. does the child hold its hands in pockets while walking?				
	C. does the child lean towards the front?				
	D. does the child walk on toes?				

HAND THERAPY – QUESTIONNAIRE FOR A PARENT OR A TEACHER					
	E. does the child, while walking on uneven surface, tries to grab its trousers, clothing?				
9.	Does the child write using whole its body?				
10.	Does the child, while swinging, cross its legs?				
11.	Does the child prop on his feet on a wide surface while catching a ball with both hands?				
12.	Does the child lift its feet from the ground while throwing a ball?				
13.	Does the child catch the ball in front of its chest?				
14.	Is there visible too high pressure of fingers to a drawing tool?				
15.	Does the child throw the ball from between its legs?				
16	Does the child like mobility?				
17	How often does the child stumble or fall down?				
18.	Has the child a trouble with getting dressed?				
19.	Is there a visible dissociation – independent movement between pelvic girdle and shoulder girdle?				
20.	Do You think that a pace of child's dressing up is slow?				
21.	Does the child change a position of its notebook, sheet of paper while writing?				
22.	Is there a visible dissociation – independent move between an arm and a forearm?				
23.	Is there a visible dissociation – independent move between a forearm and a wrist?				
24.	Is there a visible opposition of the thumb in relation to rest of the fingers?				
25.	Does the child, while writing, lean the body over the countertop of a desk?				
26.	Are the child's hands close to each other while writing?				
27.	Does the child's hand rest on the chair's bearing while writing?				
28.	Does the child break color pencil and markers while writing?				
29.	Is there a visible hold of the drawing tool with whole hand?				
30.	Is there a visible bend in a wrist while writing?				
31	Is the elbow distant to the torso while writing?				
32	Does the hand of a child touch the countertop of a desk while writing?				
33.	Are there visible joint movements in area of mouth or second helping hand while writing?				
34.	Does the child start to write from left to right?				
35.	Is there visible alternating movement of hands while the child is running?				
36.	What is the strength of hand grab while shaking hands with people?				
	- weak				
	- mediocre				
	- strong				
	- it does not shake hands				

Questionnaire is designed to be completed by a parent (parents) or by a teacher of the child and consists 42 questions related directly or indirectly (relates to several aspects at the same time) to muscle tension, appropriate posture, proprioception (deep sensation) and work of shoulder girdle. These questions are supposed to be answered by providing the most fitting to reality answer through marking an appropriate field with X. Each of the questions may be answered by choosing one of four possibilities, which were assigned with point values:

Always – 3 pts.

Frequently – 2 pts.

Sometimes – 1 pt.

Never – 0 pts.

Questionnaire also contains independent questions which are not taken into account while calculating the score, independent questions are: 5,10, 11, 18, 19, 29, 35.

Questionnaire presented above may become a basis to plan and perform intervention for an examined child. In dependence of acquired score, being a result of answers to questions related to specific sphere, author recommends performing activities related to specific sphere in a more or less intensive manner, depending on the fact, whether the problem is important, in accordance with table presented below.

Therapeutic recommendations			
Evaluated element of sensory processing	Point of questionnaire relating to a specific area	Total sum of points from answers to questions related to specific area	Recommendations
Postural tension	1, 2, 3, 8, 12, 13, 16, 17, 20, 21, 33, 34, 37	0-20 pts. minor problems	
		21-42 pts. mediocre problems	Recommended performing activities for a body posture and a postural tension
		42-63 pts. major problems	Intensive exercises for a postural tension, body posture
Proprioception	38, 39, 40, 41, 42	0-5 pts. minor problems	
		6-10 pts. mediocre problems	Performing proprioceptive and balance activities,
		11-15 pts.. major problems	Intensive proprioceptive and balance activities
Posture	4, 5, 6, 9, 14, 15, 25, 36	0-8 pts. minor problems	
		9-16 pts. mediocre problems	Recommended performing of activities to improve body posture
		17-24 pts. major problems	Intensive exercises for improving body posture
Shoulder girdle	22, 23, 24, 26, 27, 28, 29, 30, 31, 32	0-10 pts. minor problems	
		11-20 pts. mediocre problems	Exercises for shoulder girdle which include external rotation
		21-30 pts. major problems	Intensive exercises for shoulder girdle which include external rotation

IV. Examination of efficiency of applied therapy

Making a hypothesis.

1. I assume, that performing activities will be influencing improvement of postural tension.

2. I assume, that performing activities will be influencing proprioception.

3. I assume, that performed activities will influence the work of shoulder girdle.

4. I assume, that performed activities will influence the improvement of posture.

Group of children participating in the research

The examined group was constituted by children aged 7, which were in first class of elementary school, the group consisted of 23 boys and 7 girls. All of the children are from complete families, and live in a place which population does not exceed 15 thousand people. All of the children meet intellectual standards (all of the children completed recent psychological examination, and provided information regarding psychological and pedagogical opinion). Children which took part in the research have no neurological problems, have no epilepsy, have no cerebral palsy and have no demyelinating diseases.

Visible problem symptoms

In opinion of psychological and pedagogical counseling centers following problems were spotted (table)

In accordance with above, all of the children were subjected to evaluation with usage of the questionnaire 'Hand therapy – questionnaire for a parent or a teacher'.

Problems	Boys	Girls
Slow writing pace	23	7
Problems with writing down text from blackboard	23	7
Problems with bilateral motor coordination	23	7
Problems with incorrect pressure to a drawing tool	23	7
Problems with basketball dribbling	23	7

Identification of causes and applied therapy.

On percentage basis the results of examination (answers) are presented in the table 'Answers to questionnaire questions before and after the therapy' in lines 'measurement – before.' In order to improve the situation the author during six following months, applied for every child, a therapy of sensory integration using following exercises and games:

"Games for a functional motor and sensory system

- rolling on the ground with stopping the body every 90*,
- building bridges,
- zumba in lying position,
- skateboarding,
- push-ups,
- squats,
- sitting on sensory cushion,
- reverse plank with bent legs,

Games developing appropriate muscle tension:

- being a model game,
- Nordic walking,
- walking up the stairs,

- 'ready, steady, go!' position exercise,
- polishing floor,
- running sideways,
- lifting knees high while running.
- stretching rubber band, pike sit, hands positioned as wings, rubber band or skipping rope in hands, hooked below toes, movement – maximal dorsiflexion of feet complemented by drawing jumping rope to oneself,

Games developing appropriate range of moves, muscle strength and constitution of individual hand muscles are:

- jumping jacks
- snow angels on the ground or on the snow,
- stretching band,
- skipping
- recoiling a ball with a hand,
- swinging hands sideways,

Listed above games and exercises were performed by children also in their home, every day for 10 minutes". [9]

Comparison of answers to questionnaire questions 'Hand therapy – questionnaire for a parent or a teacher' after therapy with answers before therapy.

Answers to questionnaire questions before and after the therapy 'Hand therapy – questionnaire for a parent or a teacher'
On percentage basis.

Question	Measur.	Always	Freq.	Sometimes	Never
Does the child, while doing its homework, take following position:					
Standing?	before	63.3%	0.0%	0.0%	36.7%
	after	0.0%	0.0%	0.0%	100.0%
Sitting?	before	3.3%	0.0%	0.0%	96.7%
	after	100.0%	0.0%	0.0%	0.0%
Lying?	before	33.3%	0.0%	0.0%	66.7%
	after	0.0%	0.0%	0.0%	100.0%
Does the child bend its feet around chair railing?	before	93.3%	6.7%	0.0%	0.0%
	after	0.0%	0.0%	16.7%	83.3%
Is there a visible asymmetrical position of pelvis while child sits on a chair?	before	0.0%	0.0%	13.3%	86.7%
	after	90.0%	10.0%	0.0%	0.0%
Does the child shift the body weight balance on right buttock?	before	60.0%	0.0%	6.7%	33.3%
	after	0.0%	0.0%	6.7%	93.3%
Does the child shift the body weight balance on left buttock?	before	40.0%	0.0%	6.7%	53.3%
	after	0.0%	0.0%	3.3%	96.7%
Is there a visible symmetrical weight distribution on the pelvis?	before	3.3%	6.7%	0.0%	90.0%
	after	96.7%	3.3%	0.0%	0.0%
Did You consult with orthopedist, neurologist, physical therapist?	before	53.3%	0.0%	0.0%	46.7%
Observing child while it walks:	Measur.	Always	Freq.	Sometimes	Never
Does the child shuffle its feet?	before	86.7%	6.7%	0.0%	6.7%
	after	0.0%	0.0%	3.3%	96.7%

Does the child hold its hands in pockets while walking?	before	86.7%	0.0%	0.0%	13.3%
	after	0.0%	0.0%	0.0%	100.0%
Does the child lean its torso towards the front?	before	96.7%	0.0%	0.0%	3.3%
	after	0.0%	0.0%	3.3%	96.7%
Does the child walk on toes?	before	40.0%	10.0%	0.0%	50.0%
	after	0.0%	0.0%	0.0%	100.0%
Does the child try to grab its trousers or clothing while walking on uneven surface?	before	96.7%	3.3%	0.0%	0.0%
	after	0.0%	0.0%	0.0%	100.0%
Does the child use its whole body to write?	before	100.0%	0.0%	0.0%	0.0%
	after	0.0%	3.3%	0.0%	96.7%
Is the child able swing on a swing?	before	0.0%	26.7%	50.0%	23.3%
	after	96.7%	3.3%	0.0%	0.0%
Can the child catch the ball with both hands?	before	6.7%	73.3%	16.7%	3.3%
	after	100.0%	0.0%	0.0%	0.0%
Does the child catch the ball near its chest?	before	43.3%	46.7%	6.7%	3.3%
	after	36.7%	10.0%	36.7%	16.7%
Does the child catch the ball in front of its chest?	before	0.0%	10.0%	66.7%	23.3%
	after	86.7%	13.3%	0.0%	0.0%
Does the child throw the ball from over its head?	before	0.0%	26.7%	63.3%	10.0%
	after	90.0%	10.0%	0.0%	0.0%
Does the child throw the ball from between its legs?	before	56.7%	43.3%	0.0%	0.0%
	after	0.0%	0.0%	73.3%	26.7%
Does the child like mobility?	before	20.0%	53.3%	13.3%	13.3%
	after	76.7%	23.3%	0.0%	0.0%
Does the child stumble, fall down frequently?	before	20.0%	53.3%	13.3%	13.3%
	after	76.7%	23.3%	0.0%	0.0%
Has the child problem with dressing up?	before	33.3%	60.0%	6.7%	0.0%
	after	0.0%	0.0%	53.3%	46.7%
Is there a visible dissociation between pelvic girdle and shoulder girdle?	before	40.0%	60.0%	0.0%	0.0%
Do You think that a pace of child's dressing up is:	Measur.	Always	Freq.	Sometimes	Never
Slow?	before	63.3%	13.3%	0.0%	23.3%
	after	0.0%	0.0%	0.0%	100.0%
Fast?	before	0.0%	23.3%	0.0%	76.7%
	after	90.0%	10.0%	0.0%	0.0%
Does the child change a position of its notebook, sheet of paper while writing?	before	86.7%	13.3%	0.0%	0.0%
	after	0.0%	0.0%	6.7%	93.3%
Is there a visible dissociation between an arm and a forearm?	before	0.0%	0.0%	23.3%	76.7%
	after	96.7%	3.3%	0.0%	0.0%

doi: 10.18638/dialogo.2017.3.2.4

Is there a visible dissociation between a forearm and a wrist?	before	0.0%	0.0%	20.0%	80.0%
	after	100.0%	0.0%	0.0%	0.0%
Is there a visible opposition of the thumb in relation to the rest of the fingers?	before	0.0%	0.0%	23.3%	76.7%
	after	100.0%	0.0%	0.0%	0.0%
Does the child, while writing, lean the whole body over the countertop of a desk?	before	90.0%	10.0%	0.0%	0.0%
Do the child's hands are close to each other while writing?	before	90.0%	3.3%	0.0%	6.7%
	after	10.0%	0.0%	6.7%	83.3%
Is the child able to hold the notebook with the second hand during writing?	before	23.3%	40.0%	20.0%	16.7%
	after	100.0%	0.0%	0.0%	0.0%
Does the child break colored pencils, markers while writing?	before	83.3%	16.7%	0.0%	0.0%
	after	0.0%	0.0%	0.0%	100.0%
Is there a visible bend in wrist during writing?	before	100.0%	0.0%	0.0%	0.0%
	after	3.3%	0.0%	0.0%	96.7%
Is the elbow distant from the torso while the child is writing?	before	83.3%	6.7%	3.3%	6.7%
	after	0.0%	0.0%	3.3%	96.7%
Does the hand of the child touch the countertop of the table, desk?	before	20.0%	50.0%	16.7%	13.3%
	after	0.0%	0.0%	0.0%	100.0%
Are there visible joint movements in area of mouth, second helping hand while writing?	before	93.3%	6.7%	0.0%	0.0%
	after	0.0%	0.0%	3.3%	96.7%
Does the child start writing from left to right?	before	96.7%	0.0%	3.3%	0.0%
	after	100.0%	0.0%	0.0%	0.0%
Is there a visible alternating movement of hands while the child is running?	before	0.0%	3.3%	50.0%	46.7%
What is the strength of a hand grab while shaking hands with people.					
Weak	before	10.0%	0.0%	0.0%	90.0%
	after	0.0%	0.0%	0.0%	100.0%
Mediocre	before	0.0%	0.0%	0.0%	100.0%
	after	96.7%	3.3%	0.0%	0.0%
Strong	before	90.0%	0.0%	0.0%	10.0%
	after	0.0%	0.0%	0.0%	100.0%
It does not shake hands	before	0.0%	0.0%	0.0%	100.0%
	after	0.0%	0.0%	0.0%	100.0%
How do You evaluate the balance level of the child					
Good	before	0.0%	33.3%	0.0%	66.7%
	after	96.7%	3.3%	0.0%	0.0%
Bad	before	40.0%	10.0%	0.0%	50.0%
	after	0.0%	0.0%	0.0%	100.0%
Very bad	before	16.7%	0.0%	0.0%	83.3%
	after	0.0%	0.0%	0.0%	100.0%
Has the child concentration problems?	before	96.7%	3.3%	0.0%	0.0%
	after	0.0%	0.0%	13.3%	86.7%

Does the child, while sitting on a chair, frequently change its position?	before	93.3%	6.7%	0.0%	0.0%
	after	0.0%	0.0%	6.7%	93.3%
Is the child swinging while sitting on a chair?	before	96.7%	3.3%	0.0%	0.0%
	after	0.0%	0.0%	6.7%	93.3%
Has the child problem with body scheme?	before	30.0%	33.3%	33.3%	3.3%
	after	0.0%	0.0%	10.0%	90.0%
Has the child problem with differentiating left and right side?	before	10.0%	40.0%	46.7%	3.3%
	after	0.0%	0.0%	0.0%	100.0%

Verification of statistical hypotheses.

For every child participating in the examination, initial and final value was calculated for four questionnaire result scales. It was performed by summing up points acquired basing on diagnostic answers. Following distribution of points was used: never = 0, sometimes = 1, frequently = 2, always = 3. In case of some questions the scale was reversed – never = 3, sometimes = 2, frequently = 1, always = 0.

Variables calculated this way were subjected to normality of distribution tests. Shapiro-Wilk test was used. Results are presented in the table below.

Normality of distribution test for four subscales before and after the therapy						
Variable	Before the therapy			After the therapy		
	N	W	p	N	W	p
Postural tension	30	0.98	0.6977	30	0.96	0.2604
Proprioception	30	0.92	0.0246	30	0.46	0.0000
Shoulder girdle	30	0.94	0.0701	30	0.46	0.0000
Posture	30	0.80	0.0001	30	0.52	0.0000

For scale of postural tension the Shapiro-Wilk test results indicate that distribution of both variables (before and after therapy) do not differ significantly from normal distribution. Due to this fact comparative analysis will be performed by usage of parametric t-test (Student's) for dependent variables. In case of remaining subscales non-parametric signed-rank test of Wilcoxon will be used.

Measurement comparison.

A. Postural tension

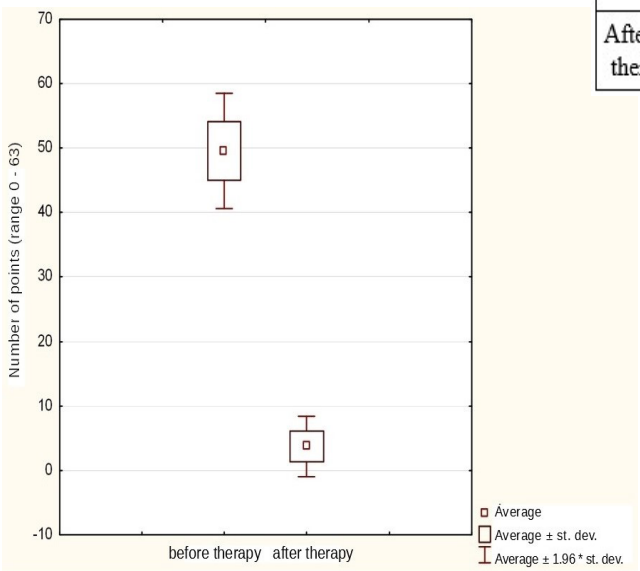
Point range: 0 – 63

Measurement	Average	Std. dev.	Difference	Diff. std. dev.	t	p
Before the therapy	49.5	4.6	45.8	5.6	44.6	0.000
After the therapy	3.7	2.4				

Analysis performed with usage of t-test (Student's) for dependent variables has shown statistically significant difference in number of points acquired by examining children before and after the therapy (t=44.9; p=0.0000). Comparison of arithmetic averages clearly shows scale of progress which took place in case of postural tension: arithmetic average of the

number of points acquired in questionnaire before the therapy was equal to M=49.5 (SD=4.6), after the therapy value of average was reduced by 45.8 points and was equal only M=3.7 (for SD=2.4).

Chart



B. Proprioception

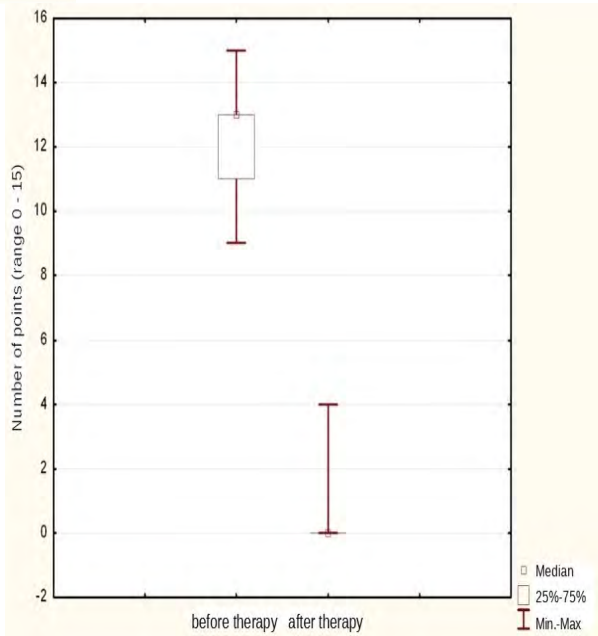
Measurement	Average	Median	Q1	Q3	SD	Z	p
Before the therapy	12,3	13,0	11,0	13,0	1,7	4,8	0,000
After the therapy	0,4	0,0	0,0	0,0	0,9		

The result of analysis conducted with usage of Wilcoxon test is statistically significant (Z=4.8; p=0.0000) Comparison of arithmetic averages and medians, clearly shows, that condition of children improved significantly. Average of number of points acquired on proprioception scale before the therapy was equal to 12.3 points (SD=1.7), and after the therapy the value was equal to only 0.4 points (SD=0.9)

The results are also possible to be presented by implementing scale of problems intensity evaluation. In that case we assume following range of assessments:

- 0-20 pts. minor problems
- 21-42 pts. mediocre problems
- 43-63 pts. major problems

Assessment of problems	Before the therapy		After the therapy	
	n	%	n	%
minor or no problems	0	0.0%	30	100.0%
mediocre problems	2	6.7%	0	0.0%
major problems	28	93.3%	0	0.0%



Assessment range:

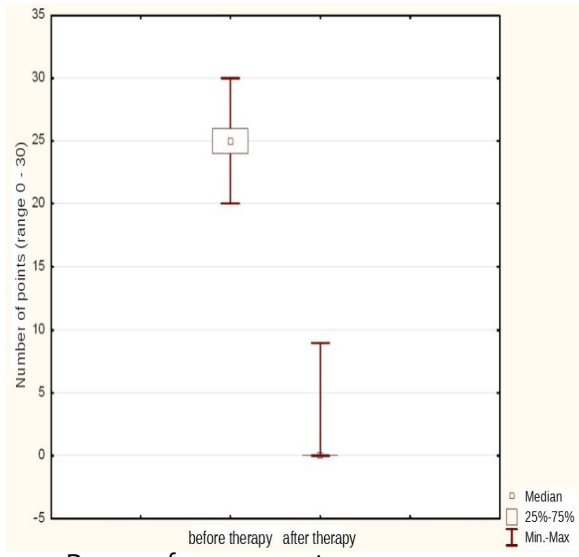
- 0-5 pts. minor problems or no problems
- 6-10 pts. mediocre problems
- 11-15 pkt. major problems

Problem assessment	Before the therapy		After the therapy	
	n	%	n	%
minor or no problems	0	0,0%	30	100,0 %
mediocre problems	3	10,0 %	0	0,0%
major problems	27	90,0 %	0	0,0%

C. Shoulder girdle

Measurement	Average	Median	Q1	Q3	SD	Z	p
Before the therapy	24,8	25,0	24,0	26,0	2,3	4,8	0,000
After the therapy	0,7	0,0	0,0	0,0	1,9		

Analogous situation as in case of proprioception scale. The result of analysis with usage of Wilcoxon's test is significant statistically (Z=4.8; p=0.0000), and comparison of arithmetic averages and medians clearly shows that the condition of children after the therapy improved significantly. The average of numbers of points before the therapy was equal to 24.8 points (SD =2.3) and after the therapy it was equal to only 0.7 points (SD=1.9)



Range of assessments:

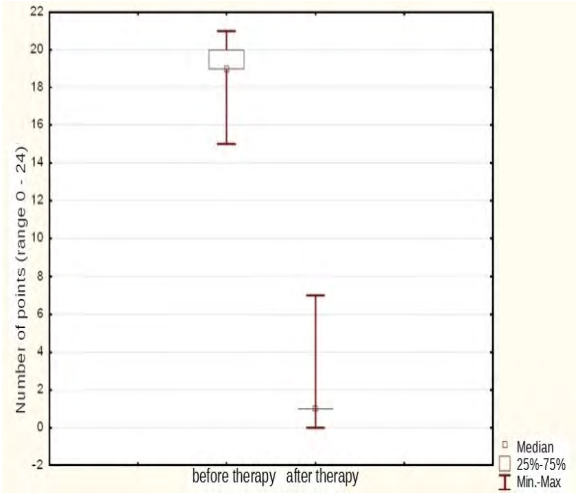
- 0-10 pkt. minor or no problems
- 11-20 pkt. mediocre problems
- 21-30 pkt. major problems

Problem assessment	Before the therapy		After the therapy	
	n	%	n	%
minor or no problems	0	0,0%	30	100,0%
mediocre problems	1	3,3%	0	0,0%
major problems	29	96,7%	0	0,0%

D. Posture

Measurement	Average	Median	Q1	Q3	SD	Z	p
Before the therapy	19,3	19,0	19,0	20,0	1,1	4,8	0,000
After the therapy	1,1	1,0	1,0	1,0	1,2		

In this case the analysis also showed significant statistical difference between measurements (Z=4.8; p=0.0000). Condition of children after the therapy has improved significantly. Before the start of the therapy the average of number of acquired points was equal to 19.3 (SD=1.1) and after the therapy it was reduced to the following value: 1.1. points (SD=1.2).



Assessments range:

- 0-8 pts. minor or no problems
- 9-16 pts. mediocre problems
- 17-24 pts. major problems

Problem assessment	Before the therapy		After the therapy	
	n	%	n	%
minor or no problems	0	0,0%	30	100,0%
mediocre problems	1	3,3%	0	0,0%
major problems	29	96,7%	0	0,0%

Conclusions

Applied exercises were designed to address specific areas of children problems. They constituted a set of tasks supporting child's development. Child's systematic work in its home and during the therapy enabled to improve grapho-motor abilities in a quick way, what was confirmed by statistical results presented above. While addressing functioning of the child there had been several improvements in areas such as auto orientation and spatial orientation, manual and motor abilities, improved visual-motor coordination.

Important element of child's development is acquiring new experiences and abilities, it is essential that we discover hidden potential of children and show them the way, which will enable to use and undertake activities supporting their education and development. The fundamental condition to fulfill that aim is openness and creative perception of a teacher, a parent or a therapist towards the child, who as a guide, should lead the child through intricate ways of obtaining knowledge and skills is a way enabling the child to succeed in various aspects of life.

All research mentioned above shows that thanks to hard work of children, therapists, parents and the others the child's conscious of its body increases and its self-esteem increases, too. It helps to keep it's soul healthy.

References:

1. Bart O., Hajami D., Bar-Haim Y., "Predicting School Adjustment from Motor Abilities in Kindergarten" in *Infant and Child Development*, 2007, vol. 16, pp. 597–615,

2. Błaszkiewicz I., "Metody usprawniania podstawowych kompetencji grafomotorycznych" ("Improvement methods of the base grapho-motor

competency"), *Szkoła Specjalna*, s.237, 4/2002.

3. Bogdanowicz M., "Model rozpoznawania specyficznych trudności w nauce czytania i pisania." (Model of recognising specific difficulties in learninng of reading and writing"), *Zeszyty Naukowe* Nr 11, Fundacja Promyk Słońca, Wrocław 2011, pp. .21-27.

4. Boscheinen – Morrin J., Conolly B., *Ręka podstawy terapii* ("The Hand"), Kraków: Elipsa-Jaim, 2003 , p. 9,

5. Matyja M., Domagalska M., "Podstawy usprawniania neurorozwojowego wg Berty i Karela Bobathów" (The basis of neuro-developmental improvement acording to Bert and Karel Bobath"), Katowice: AWF Katowice, 2011.

6. Grzesiak J, Naskręt M., Bronikowski M., "Znaczenie koordynacji ruchów ręki 6- i 7-latków" (Importance of hand movement coordination at six and seven-years-old children") in *Rozprawy naukowe*, AWF we Wrocławiu, vol. 47, Wrocław 2014,

7. Sitek A., Malinowski A., "Dynamika rozwoju reki u dzieci i młodzieży poznańskiej w wieku od 1,5 do 18 lat" ("The dynamics of hand development for children and juveniles from Poznań, aged from 1.5 to 18"), *Słupskie prace biologiczne in Biological works of Słupsk,* 2005, p. 149,

8. Smits-Engelsman BCM, Stevens M, Vrenken I, Hagen van A "Systematic detection of writing problems (SOS): a teachers' tool for signaling motor based writing problems in elementary education children and children in special need education" "Ned Tijdschr Kinderfysiotherapie" ("Dutch Magazine for Pediatric Physiotherapy") 2005; vol. 17(47), p. 16-21

9. Szmalec J., "Support of manual dexterity of preschool and elementary school children.", *The 4th Global Virtual Conference - GV 2016*, ISBN: 978-80-554-1197-2 ISSN: 1339-9373.