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KINESTHETIC-TACTILE SENSITIVITY OF HAND AND SKILL OF DRAWING SHAPE STUDENTS WITH CEREBRAL PALSY

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SUMMARY

Drawing represent complex motor-gnostic skill that require a certain maturity level neuromuscular structures, and precedes the skill of writing, which is very important in the development of each child. Kinesthetic and tactile sensitivity of hand are perceptual abilities that are closely related to the act of writing, and therefore the aim of the research is showing the importance of tactile-kinesthetic sensitivity of hand during drawing geometric shapes. The research has been conducted in Belgrade, 2016., in a special elementary school "Miodrag Matić", in sample of 14 children with cerebral palsy and associated mild intellectual disability. For assessing tactile-kinesthetic sensitivity of hand was used Luria-Nebraska Neuropsychological Battery and for assessing the skills of drawing geometric shapes is used Acadia test of development abilities. The results show the presence of correlation between the kinesthetic sensitivity of the hands and skills of drawing geometric shapes, drawing a square (p=.000), cross (p=.000), diagonal lines (p=.000), triangle (p =. 000) and circuit (p=.005). Also, tactile perception is determinant of drawing skills, and the strongest correlation between the examined parameters was found between discrimination two points of contact with drawing a circle (p=.020), square (p=.000), cross (p=.001), slashes (p=.002) and the triangle (p=.001). Also, graphesthesia form is correlated with drawing a circle (p=.009), square (p=.000), cross (p=.000), slashes (p=.000) and the triangle (p=.000) and graphesthesia numbers. Stereognosis also correlated with drawing a circle (p=.003), square (p=.003), cross (p=.004), slashes (p=.003) and the triangle (p=.006). Despite the limitations of a small sample the results obtained support the theoretical assumptions about the importance of tactile-kinesthetic perception in handling a pencil.

Key words: cerebral palsy, drawing, geometric shapes, kinesthetic-tactile sensitivity of hands, perceptions

INTRODUCTION

Development of drawing skills is a very important skill that precedes the skill of writing. Drawing represents a skill in which the arm is released and preparation for the phase of writing. Even drawing the simplest of shapes and drawings, such as, for example, "Stickman" is the initial step in preparing hand for the holding a pencil and writing of complex symbols, and letters.

According Gligorović and Vučinić (2011) development of drawings usually starts at the end of the somatosensory period, phase doodling or scribble. Brković (2011) describes the stages of development of children's drawings. Phase scribbling is present at the age of 2 to 3 years, followed by a phase of a symbolic drawing, which is present at the age of 3 to 7 years. In primary school students are present phase visual realism (age 8 to 9 years) and phase realistic drawings that develops at the age of 10 years. Drawing is also used as a diagnostic tool to assess the level of intellectual development of the child. Given that the drawing used as an indicator of intellectual maturity (Watkins, Glutting & Youngstrom, 2005), represents a very important motor-gnostic ability.

Children with cerebral palsy often have difficulty in perceiving stimuli that surrounding them. Common motor and gnostic impairment, with frequent difficulty of visual, tactile and kinaesthetic perceptions, hinder the adoption of school activities, and therefore their drawing skills. Cerebral palsy as a condition with no tendency to progression, caused by damage to children's brain in development, as a result of influence prenatal, natal and postnatal factors. According Bax (1964, according to Morris, 2007: 3), cerebral palsy is a "non-progressive disorder of mobility and body posture that is caused by a defect or an injury of the immature brain," and Morris (Morris, 2007: 6) emphasizes the association of motor disorders with disorders of the senses, perception, cognition, communication, behavior, along with epileptic seizures and all kinds of bone and joint damage.

The information which is obtained during the catching and manipulation of objects are very important for the development of sensory-motor function, and grip of pencil during writing and drawing illustrates the position of the fingers during manipulation of the pencil. The manipulation of object includes a number of mechanical phase in which the object catches, moves, and brings into contact with another object and eventually released (Flanagan et al., 2006). Somatosensory system as a complex system who receives information from the skin, muscles and joints and gives us information on the signals that receive tactile and proprioceptive receptors, receptors for temperature and pain, have a very important role in organizing the activities of daily living. Kinesthetic sensitivity, according to Feder and Majnemer (2007) defined as the ability to discriminates positions of body parts, as well as the amplitude and direction of one's movements. Kinesthetic information obtained by moving the muscles, ligaments and joints of the extremities, and according to Danna and Velay (2015) provides us sensory information about movements. Tactile sensitivity represents the ability to discriminate two simultaneous tactile sensation, but is conditioned by the number of tactile receptors in the skin and the size of the representation of those parts of the cortex-sensitive zone (Radojčić, 2003). According Jablan (2002: 53) in tactile senses belong to touch, pressure and vibration. The sense of touch is generally from tactile stimulation of receptors in the skin or the tissue just below the skin. Feeling of pressure usually is caused by deformities of deeper tissue structures, and sense of vibration due to rapid repeated sensory signals. It provides us information about the shape, texture, pressure and manipulation of objects.

The results of a research conducted by Sarkar (2013) on a sample of 180 students aged 6 to 8 years, was obtained negative correlation between cognitive ability and kinesthetic perception, but this association becomes stronger in relation to the child's age. Gligorović and Vučinić (2011) examining the quality of drawings younger school children, aged 8 to 11 years, on a sample of 400 students, for assessing the skills of drawing were used Acadia test. The analysis results established that the achievements in the field of drawing are better, but not statistically significant from achievement of the tasks of tracing form. In 81.8% of subjects while drawing shapes accomplishments are expected for age. It also revealed the presence of statistic significant correlation between class that respondents attend and quality of the drawings ($p \le 0.000$-0.001). Achievements of girls are statistic significantly better than the achievements of boys ($p=0.048$). According Nedović, Trgovčević, Kulić and Marinković (2012) problems in drawing and writing children with cerebral palsy can be seen as the result of motor and perceptual deficits.

RESEARCH METHODOLOGY

As objects of existing research dealing with the skills of drawing children with cerebral palsy are not oriented to obtaining knowledge about the importance and participation kinesthetic and tactile perception, the subject of this study is to assess the existence of correlation between the kinesthetic-tactile sensitivity of hands and skills of drawing geometric shapes children with cerebral palsy.

The main aim of the research is to show the level of development of kinesthetic-tactile sensitivity of the hands children with cerebral palsy, as well as to show the connection between tactile-kinesthetic sensitivity hand with the ability of drawing geometric shapes.

Based on the defined object and aim of the research, are defined the following hypothesis: (1) It is assumed that kinesthetic perception is an important determinant of the skills of drawing geometric shapes children with cerebral palsy; (2) It is assumed that tactile perception is an important determinant of the skills of drawing geometric shapes children with cerebral palsy.

In the study are used the following instruments:

1. Drawing geometric shapes were tested using the ACADIA test of developmental abilities (Atkinson, Jonston & Lindsay, 1972), subtest 4. This subtest contains 20 items and is designed for children of regular population, so a majority of the tasks is complex for children with cerebral palsy. Because, in this study we used only the first five forms, in order of complexity. Students were asked to draw a circle, square, cross, diagonal lines and triangle. Given that the original criteria are inappropriate for children with cerebral palsy, has been modified the scoring methods used by Rapaić, Nikolić and Nedović (1995). For each task it is possible to achieve 6 points. With 0 points are estimated when is absence of geometric shapes, to a maximum of 5 points, when the drawn shape completely accurate in relation to a given geometric shape. In each drawing geometric shapes student are allowed three attempts, and it is estimated that the most successful drawing.
2. Kinesthetic-tactile sensitivity of hands was evaluated using the Luria-Nebraska Neuropsychological Battery (Luria-Nebraska Neuropsychological Battery: Children's Revision, Golden et al., 1987). Assessment kinesthetic perception was carried out using a part of the motor subscale, or task "kinesthetic based movement," and refers to the position of imitation fingers and hands, eyes closed, on both hands. Evaluation of tactile perception was carried out using the

same battery of tests, or 16 tasks scale of tactile perception. Tasks in this scale are: tactile localization, sharp-dull discrimination, discrimination strength of touch, tactile discrimination two points, determining the direction of the contact, graphesthesia and stereognosis.

3. MACS test (Manual ability classification system, Eliasson et al., 2006) for the assessment of manual skills of children with cerebral palsy. Depending on the achievements of this test, the students were classified into four groups. Assessment of manual skills of students was carried out with the aim of equalization a fine manipulative abilities of students.

The research sample of the research included 25 children with cerebral palsy, on lavel of mild intellectual disability. Based on the achievements of the test MACS (Manual ability classification system) were singled out students who belong to the group one and two, those students who can easy or predominantly good manipulate with objects. Therefore, the research sample was formed by 14 children with cerebral palsy, with mild intellectual disability, who have educational work covered in the elementary school "Miodrag Matić", during the second term of the academic year 2015/2016. To determine the students involved in the research was used and existing medical documentation.

RESEARCH RESULTS

As the first task of the research relates to showing the correlation of kinesthetic sensitivity hands children with cerebral palsy with the skills of drawing geometric shapes, a first starting assumption is that kinesthetic perception is an important determinant of the skills of drawing geometric shapes. The analysis of the achievements is done with Spearman's correlation coefficient. In Table 1 and Table 2 shows the achievements on tests kinaesthetic sensitivity hands and the ability of drawing geometric shapes, in Table 3 shows the correlation between the examined parameters.

Table 1 *Student achievement on the test kinesthetic sensitivity hand*

Kinesthetic sensitivity hand	Right hand				Left hand			
	Good		Bad		Good		Bad	
	N	%	N	%	N	%	N	%
Task 1	6	42.9	8	57.1	4	28.6	10	71.4
Task 2	5	35.7	9	64.3	4	28.6	10	71.4

Table 1 shows the students' achievements on the test kinesthetic sensitivity of hands. During the execution of the first task, the students recorded a better achievement of the right hand. 6 pupils (42.9%) achieved good results on the right hand while the left hand 4 students (28.6%). During the execution of a second task, subjects recorded worse achievements in relation to the first test, where 5 students (35%) are heard running this test on his right hand, and 4 pupils (28.6) on the left arm. Based on these results we can see that students with cerebral palsy worse achievements realized on the test kinesthetic sensitivity of hands.

Table 2 *Student achievement on the test drawing geometric shapes*

Achievements	Achievements at Acadia test									
	Drawing a circle		Drawing squares		Drawing cross		Drawing diagonal lines		Drawing triangle	
	N	%	N	%	N	%	N	%	N	%
Absence of geometric shapes	6	42.9	8	57.1	7	50	8	57.1	8	57.1
Shape drawn with no appearance of a given geometric shape	/	/	/	/	1	7.1	/	/	/	/
Shape drawn lesser extent has the appearance of a given geometric shape	/	/	/	/	1	7.1	2	14.3	/	/
Shape drawn largely has the appearance of a given geometric shape	1	7.1	/	/	/	/	/	/	1	7.1
Shape drawn correct form of the required geometrical shape	2	14.3	2	14.3	/	/	/	/	/	/
Drawn shape completely accurate in relation to a given geometric shape	5	35.7	4	28.6	5	35.7	4	28.6	5	35.7

The results presented in Table 2 shows student achievement on the test drawing geometric shapes. Students with cerebral palsy and associated mild intellectual disability exercised poor achievements in this test. Absence of geometric shapes while drawing a circle is present in 42.9% of the students, squares 57.1% students, 50% of the cross, diagonal lines at 57.1% and 57.1% at triangle. A small number of students can drawn in a form that is completely accurate in relation to a given geometric shapes, with the best accomplishments achieved in drawing the circle, cross and triangle (35.7%).

Table 3 *Correlation of skill drawing geometric shapes and kinesthetic sensitivity hand*

Kinesthetic tasks		Achievements at Acadia test									
		Drawing a circle		Drawing squares		Drawing cross		Drawing diagonal lines		Drawing triangle	
		r	p	r	p	r	p	r	p	r	p
Kinesthetic sensitivity hand (task 1)	Right hand	0.707	.005	0.966	.000	0.942	.000	0.966	.000	0.978	.000
	Left hand	0.607	.021	0.750	.002	0.774	.001	0.750	.002	0.804	.001
Kinesthetic sensitivity hand (task 2)	Right hand	0.750	.002	0.915	.000	0.912	.000	0.915	.000	0.947	.000
	Left hand	0.607	.021	0.750	.002	0.774	.001	0.750	.002	0.804	.001

Correlation is significant at the 0.05 level

The results in Table 3 shows the existence of a correlation between the kinesthetic sensitivity of the hands and drawing geometric shapes. Given the correlation between the level of $p<0.05$ between kinaesthetic sensitivity of the right hand during the presentation of the first task in which the children had task with eyes closed, after a demonstration, brought his thumbs to his ring finger, and the skills of drawing a circle (p= .005), drawing squares (p= .000), drawing cross (p= .000), slashes (p= .000) and drawing a triangle (p= .000) there was significant correlation. During the performance of the task on left hand, recorded the existence of a correlation between the kinestetic sensitivity hand and skills of drawing a circle (p= .021), square (p= .002), cross (p= .001), diagonal lines (p= .002) and triangle (p=. 001). Between kinaesthetic sensitivity of the right hand which is evaluated through a test that included merger of thumb with themiddle finger, after the demonstration, eyes closed, and the skills of drawing a circle (p= .002), square (p= .000), cross (p= .000), slashes (p= .000) and the triangle (p= .000) record the existence of significant correlations. During the performance of the task on left hand, recorded the existence correlation between kinesthetic sensitivity hand and drawing a circle (p= .021), square (p=. 002), cross (p= .001), slashes (p= .002) and triangle (p=. 001). The results show the existence of a positive correlation between skill drawing geometric shapes and kinesthetic sensitivity of hand children with cerebral palsy and associated mild intellectual disability.

As the second task of the research relates to showing the connection of tactile perception of children with cerebral palsy with the skills of drawing geometric shapes, and other initial assumption is that tactile perception is an important determinant of the skills of drawing geometric shapes, the analysis of the achievements is done with Spearman's correlation coefficient. In Table 4 shows the achievements on tests tactile sensitivity of the hands and in Table 5 shows the correlation between the examined parameters.

Table 4 *Student achievement on the test tactile sensitivity hand*

Tactile sensitivity hand	Right hand						Left hand					
Localization tactile touch	0 errors		2-8 errors				0 errors		2-8 errors			
	N	%	N	%			N	%	N	%		
	12	85.7	2	14.3			12	85.7	2	14.3		
Discrimination sharp-dull	0 errors		1 error		2-5 errors		0 errors		1 error		2-5 errors	
	N	%	N	%	N	%	N	%	N	%	N	%
	5	35.7	3	21.4	6	42.9	3	21.4	5	35.7	6	42.9
Discrimination strength pressure	0 errors		1 error		2-4 errors		0 errors		1 error		2-4 errors	
	N	%	N	%	N	%	N	%	N	%	N	%
	4	28.6	1	7.1	9	64.3	4	28.6	/	/	10	71.4
Discrimination two points of contact	5 mm		10 mm		more than 10 mm		5 mm		10 mm		more than 10 mm	
	N	%	N	%	N	%	N	%	N	%	N	%
	1	7.1	3	21.4	10	71.4	2	14.3	3	21.4	9	64.3
Determining the direction of contact	0 errors		1-2 errors				0 errors		1-2 errors			
	N	%	N	%			N	%	N	%		
	4	28.6	10	71.4			6	42.9	8	57.1		
Graphesthesia – forms	0 errors		1 error		2-3 errors		0 errors		1 error		2-3 errors	
	N	%	N	%	N	%	N	%	N	%	N	%
	3	21.4	3	24.4	8	57.1	3	21.4	4	28.6	7	50
Graphesthesia – numbers	3	21.4	5	35.7	6	42.9	1	7.1	5	35.7	8	57.1
Stereognosis	0 errors		1 error		2-4 errors		0 errors		1 error		2-4 errors	
	N	%	N	%	N	%	N	%	N	%	N	%
	3	21.4	8	57.1	3	21.4	4	28.6	6	42.9	4	28.6

The results presented in Table 4 shows the achievements of students with cerebral palsy in the test of tactile sensitivity of hands. The best achievements of students performed during the execution of the task of localization of tactile prefer, where the largest number of students (85.7%) did not record any mistakes when performing this task. When discrimination sharp and blunt pen works, only 35.7% of students in discrimination on the left arm and 21.4% in the right hand, do not record any error, while the rest of the students present one or more errors. When discrimination strength pressure, recorded the highest number of students from 2 to 4 is errors in the discrimination of the right hand (64.3%) and 71.4% on the left hand. When discrimination two points of contact, the students best discriminate contacts at a distance of more than 10 mm, 71.4% students on the right hand and the left hand 64.3%. In determining the direction of the contact, the students recorded the highest percentage of 1 to 2 errors, 71.4% on right hand and 57.1% on left hand. During the task graphesthesia when students had the task to recognize geometric shapes that are drawn on the palm of their hand, 57.1% of students recorded 2 to 3 errors on their right arm and 50% on the left hand. During the execution of the following task graphesthesia, when students had the task to recognize the numbers that are printed on the palm of the hand, 42.9% of students recorded 2 to 3 errors on the right hand and 57.1% in the left hand. During the execution task stereognosis, where students had the task to recognize items that have been in the arm, while the eyes are closed, the largest number of students recorded after 1 mistake on his right arm (57.1%) and left arm (42.9%).

Table 5 *Correlation of skill drawing geometric shapes and tactile perception*

Tactile tasks		Achievements at Acadia test									
		Drawing a circle		Drawing squares		Drawing cross		Drawing diagonal lines		Drawing triangle	
		r	p	r	p	r	p	r	p	r	p
Localization tactile touch	Right hand	0.433	.122	0.342	.232	0.388	.170	0.342	.232	0.346	.226
	Left hand	0.433	.122	0.342	.232	0.388	.170	0.342	.232	0.346	.226
Discrimination sharp-dull	Right hand	0.370	.193	0.607	.021	0.578	.030	0.607	.021	0.648	.012
	Left hand	0.395	.162	0.633	.015	0.620	.018	0.633	.015	0.688	.007
Discrimination strength pressure	Right hand	0.521	.056	0.541	.046	0.556	.039	0.672	.008	0.600	.023
	Left hand	0.398	.156	0.397	.160	0.430	.125	0.529	.052	0.469	.091
Discrimination two points of contact	Right hand	0.611	.020	0.873	.000	0.756	.001	0.751	.002	0.759	.001
	Left hand	0.354	.214	0.621	.018	0.506	.065	0.516	.059	0.551	.041
Determining the direction of contact	Right hand	0.545	.044	0.617	.019	0.645	.013	0.750	.002	0.670	.009
	Left hand	0.707	.005	0.966	.000	0.942	.000	0.966	.000	0.978	.000
Graphesthesia – forms	Right hand	0.669	.009	0.929	.000	0.882	.000	0.929	.000	0.916	.000
	Left hand	0.407	.149	0.696	.006	0.636	.014	0.696	.006	0.686	.007
Graphesthesia – numbers	Right hand	0.562	.036	0.842	.000	0.761	.002	0.842	.000	0.821	.000
	Left hand	0.593	.025	0.779	.001	0.751	.002	0.779	.001	0.799	.001
Stereognosis	Right hand	0.737	.003	0.730	.003	0.712	.004	0.730	.003	0.693	.006
	Left hand	0.768	.001	0.843	.000	0.822	.000	0.764	.001	0.801	.001

Correlation is significant at the 0.05 level

The results in Table 5 shows the existence of a correlation between the tactile perception and skill of drawing geometric shapes. During the task of localization tactile touch, respondent has localize the tactile tease while eyes are closed, touching by the examiner, and the results show that the localization of these tactile on the left and right side of the body doesn't correlate with the skills of drawing geometric shapes. During the task sharp-dull discrimination, the respondent has a task to assess whether the examiner touches sharp or blunt part of pencil/pin, and the results show that this kind of discrimination of tactile stimuli correlated with the skill of drawing squares (p= . 021), cross (p= . 030), slashes (p= .021) and the triangle (p= .012) in the right hand, as well as drawing a square (p= .025), cross (p= .018), slashes (p= .015) and the triangle (p= .007) in the left hand. During the task discrimination strength pressure respondent has a task to assess the strength of the skin by the examiner, and the results show that the strength of touch is in correlation with the skill of drawing squares (p= .046), cross (p= .039), slashes (p= .008) and the triangle (=.023) during the execution of tests on his right hand, while performing during the task on the left hand not present correlation. During the task discrimination two points of contact, examiner estimated distances discrimination two tactile stimulus which the examinee may be perceived, and the results show that this kind of tactile discrimination is very important and correlated with the skill of drawing, on the right hand. It is noted the existence of correlation with drawing a circle (p= .020), square (p= .000), cross (p= .001), slashes (p= .002) and the triangle (p= .001) in the right hand, and drawing squares (p= .018) and the triangle (p= .041). During the performance tests determine the direction of contact, the existence of correlations on the right and on the left hand with the skill of drawing a circle (right hand p= .044, left hand p= .005), square (right hand p=.019, left hand p= .000), cross (right hand p=.013, left hand p=.000), slashes (right hand p= .002, left hand p=.000) and triangles (right hand p=.009, left hand p= .000). During the execution of the first task graphesthesia, children must to recognize geometrical shape that is written on the palms, while eyes closed. The results shows that the graphesthesia is very important skill for drawing geometric shapes, and that is correlated with drawing a circle (right hand p= .009), square (right hand p= .000, left hand p= .006), cross (right hand p= .000, left hand p= .014), slashes (right hand p= .000, left hand p= .006) and triangles (right hand p= .000, left hand p= .007). During the conduct of another task graphesthesia, children must to recognize numbers who are printed on the palms, while eyes closed. The results shows that the graphesthesia is very important skill for drawing geometric shapes, and that is correlated with drawing a circle (right hand p= .036, left hand p= .025), square (right hand p= .000, left hand p= .001), cross (right and left hand, p= .002), slashes (right hand p= .000, left hand p= .001) and triangles (right hand p= .000, left hand p= .001). The results shows that the stereognosis is very important skill for drawing geometric shapes, and that is correlated with drawing a circle (right hand p= .003, left hand p= .001), square (right hand p= .003, left hand p= .000), cross (right hand p= .004, left hand p= .000), slashes (right hand p= .003, left hand p= .001) and triangles (right hand p= .006, left hand p= .001).

DISCUSSION OF RESULTS

When assessing the integration of tactile-kinesthetic sensitivity of the hands and the ability of drawing geometric shapes, students with cerebral palsy and associated mild intellectual disability, realized poor achievements on the test tactile and kinaesthetic sensitivity of hands, and on Acadia test. These students during the execution of the tasks for the evaluation of kinaesthetic sensitivity hand, achieve better achievements in their right hand, while only 42.9% of the students during the execution of the first task and 35% of the students during the second task achieved good results. Assessment of tactile sensitivity of hand come to the conclusion that the best achievements of students performed during the execution of the task of localization of tactile prefer, where the largest number of students (85.7%) did not record a single mistake. During the sharp-dull discrimination, discrimination volume pressure, determining the direction of contact, graphesthesia geometric shapes and numbers and stereognosis, over 50% of the students recorded one or more mistakes on both hands. For most of the students recorded the absence of a given geometric shape, during drawing a circle 42.9% of pupils, while when drawing the square, cross, triangle and diagonal lines in more than 50% of the students.

Results from this study show that kinesthetic perception is determinant of drawing skills. We record the presence of correlation between the sensitivity of the hands and kinesthetic skills of drawing geometric shapes. Between kinaesthetic sensitivity of the right hand during the performance of both task and drawing squares (p=.000), cross (p=.000), slashes (p=.000), triangle (p=.000) and a circle (p=.005, p=.002), there is a significant correlation which is present at the performance of these task left hand.

Results from this study also show that the tactile perception is determinant of drawing skills. The strongest correlation between the examined parameters was found between discrimination two points of contact with drawing a circle (p=.020), square (p=.000), cross (p=.001), slashes (p=.002) and the triangle (p=.001) on the right hand and on his left hand. Also, graphesthesia is very important skill for drawing geometric shapes, and is correlated with drawing a circle (p=.009), square (p=.000), cross (p=.000), slashes (p=.000) and triangle (p=.000), as well as graphesthesia numbers. Stereognosis also correlated with drawing a circle (p=.003), square (p=.003), cross (p=.004), slashes (p=.003) and the triangle (p=.006).

Correlation is present between discrimination sharp and blunt stimuli, discrimination strength pressure, determining the direction of contact and drawing a circle, square, cross, triangle and diagonal lines, while the localization of tactile touch isn't determinant of drawing.

Soldo, Janeković and Grozdek were nearly 30 years ago (1987) conducted a study to evaluate the ability of drawing a shape of children with cerebral palsy aged 8 to 10 years, using the Acadia test on a sample of 15 students. How they would sure that the ability of drawing shapes are improves, they conducted a special treatment. One group with five students conducted visual-motor treatment with another group taktile-manipulative treatment and the third group combined visual-motor and taktile-manipulative treatment. The obtained results show the existence of improving skills of drawing shapes in all three experimental group subjects.

Rapaić, Nikolić and Nedović (1995) evaluated the graphomotor abilities of children with cerebral palsy, and examine the ability of drawing shapes 68 students, aged 7 to 16 years. As the instrument is used Acadia test, and the results show that more than 66% of these students have extremely bad graphomotor capabilities. The success of implementation of tasks decreases going toward more complex geometric shapes. Score 0, or score which assesses drawn shape that does not fit in any element of a given geometrical shape is present in the majority of cases (34.57%). Based on these results, it can be concluded that the graphomotor ability of these students are very bad. Good graphomotor capabilities are present in 8.74% of the students. Less successful were present in 40.67% of the students, while the majority of students (50.84%) present extremely bad graphomotor capabilities.

Nedović, Trgovčević, Kulić and Marinković (2012) estimated the graphomotor abilities of children with cerebral palsy at the age of 17 pupils, aged 7 to 16 years, on the level of mild intellectual disability. One of the used tests is also Acadia test, subtest drawing shapes. The obtained results show that gender is determinant which is correlated with the achievements in the subtest drawing a shape, but it was not statistically significant ($p>0,05$), and more than 60% of student with cerebral palsy have poor graphomotor skills.

Dimić and Soldo (1990) show the importance of special education treatment in the preparation children with cerebral palsy for school learning. By measuring the achievements of all the subsets of Acadia test and application of psychomotor therapy through exercise experience physical integrity, exercises detecting the position of the body in space, exercise to improve handling skills, practice visual perception, memory exercise, show a significant improvement in the achievements of Acadia test.

Study results Winger et al. (2009) showed that people with cerebral palsy have proprioceptive deficits on both sides of the body. Evans (2007), based on studies conducted with a group of patients with cerebral palsy (15 patients) and the group of patients without cerebral palsy (15 patients), came to the result that the level of cerebral palsy significantly correlated with passive reproduction movement. Opila-Lehman et al. (1985) evaluated the kinesthetic ability of children with spastic and athetoid cerebral palsy, ranging in age from 8 years 7 months through 15 years 8 months, and found that the children with cerebral palsy had decreased kinesthetic ability, compared to children of the same age without cerebral palsy.

To test the tactile perception of children with cerebral palsy, Auld et al. (2012) conducted a study on a sample of 52 children with cerebral palsy, aged 8 to 18 years and 34 children with typical development. To level the motor skills of respondents, was applied Gross motor function classification system and the ability Manual classification system, a cause of the involved subjects who belong to the group one and two. Children with cerebral palsy experience significantly poorer achievements of children with typical development. 40% of these respondents have a tactile deficits. Kinnucan et al. (2010) emphasize the correlation of stereognosis and motor function in patients with cerebral palsy.

CONCLUSION

Drawing skills and the quality of the drawings may serve us as an indicator of child development. Therefore, already at an early age, using the drawing, can be defined models of support and stimulation of skills that are important for this skill. Tactile and kinestetic sensitivity of hands are abilities which must be stimulated in an early age, all with the aim of fostering the skills of drawing, and therefore writing. Activities such as games with materials of different textures, capturing and inserting the object of various sizes, play imitations and placing the body in a different position, are some activities that can be implemented on a daily basis.

Despite the limitations of a small, conveniently sample, without control group, the results support the theoretical assumptions and the results of other studies which show the importance of kinesthetic perception and tactile sensitivity in handling pencil and overcoming acitity, that are very important in modern society.

Today, due to technological developments, in a growing number are available assistive devices that can help students with cerebral palsy in overcome the skills of drawing and writing.

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