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EVALUATION OF THE PROCESSING OF SENSORY PROCESSES IN THE PROCESS OF NEURODEVELOPMENT TREATMENT

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Abstract

The proper development of sensorimotor integration depends on the efficient functioning of the central nervous system and on the inflow of the right amount of stimuli from your own body and from the environment. Integration of information from basic sensory systems - vestibular, proprioceptive and tactile - plays a particularly important role here. Appropriate stimulation of the nervous system by stimuli derived from the three basic senses is essential for proper psychomotor development of the infant. The high plasticity of the ripening central nervous system means that early treatment may cause the alleviation or even withdrawal of pathological symptoms. The aim of the study is to assess the level of sensory integration in children with locomotive motor disorders and to assess the possibility of stimulation of this process during NDT-Bobath therapy.

The research included 43 children aged 4-12 months in the Świętokrzyskie Province. The tests used the Sensomotor Functions Test in Infants (TSFI), which were carried out twice (before the rehabilitation and after four months of therapy). Before starting the rehabilitation, 81% of the children experienced impaired processing of sensory integration processes. After four months, this percentage decreased to 47%. The most significant changes were found in the field of touch and vestibular integration. Disturbances in the processing of sensory integration processes are a significant problem in children with motor-related disorders of central origin. The NDT-Bobath method improves the functioning of sensory processes.

Key words: sensory integration, children, TSFI test, NDT- Bobath

INTRODUCTION

The first experiments in the field of basic sensory systems are already obtained in fetal life. After birth, their integration in the central nervous system is still at a low level. The development of sensorimotor integration is more intensive in the period from birth to the end of the pre-school period, and the final result is the ability to create concepts, reading, writing, counting, acquiring new movement skills and socially accepted behavior [1]. The correct development of the antigravity mechanism is the basis for all spheres of psychomotor development: posture and locomotion, visual-motor coordination, social contacts and speech. Limitations resulting from movement disorders do not allow for gaining proper sensory-motor experiences in other spheres of development. One of the first signs of CNS dysfunction observed in the first months of a child's life is the abnormal motor development [2]. There are many factors affecting the occurrence of irregularities in the process of sensory integration, which may occur at any stage of development. The most extensive damage is caused by disturbances on the lowest, basic floors of sensory integration processes, because they make it impossible to build a foundation for the formation of complex sensomotor skills.

The high plasticity of the ripening CNS means that early treatment may cause the alleviation or even withdrawal of pathological symptoms. In this case, brain damage competes with repair processes, which consist of maturation and plasticity [3].

The condition for proper development in the discussed range is the inflow to the CNS of the appropriate amount of various stimuli received from one's own body (basic senses) and surroundings (superior sensory systems), as well as their development in a well-functioning and without disturbing matured nervous system [4]. Minimal brain damage creates a variety of developmental constraints that can become the source of many life problems. These include difficulties in acquiring new skills, the learning of which takes a lot more time than healthy peers, disturbed contact with the environment, problems in school learning, behavior control (hyperactivity, aggression, crying) [5].

Appropriate stimulation of the nervous system by stimuli derived from the three basic senses is essential for proper psychomotor development of the infant [6]. Proper with functioning of the OUN, the correct postural tension is developed, the appropriate organization of mutual reciprocal innervation and the creation of correct postural and motor patterns [7]. All these elements, interrelated and integrated, form a common mechanism in the central nervous system called the right mechanism of the postural reflex, which allows for harmonious and effective motor development of the child, giving him a chance to fully use his own potential [8,9].

The NDT-Bobath method is used all over the world, the assumptions and methods adopted therein do not cause controversy and are widely accepted. NDT- Bobath is a neurodevelopment therapy used by physiotherapists, occupational therapists and speech therapists. this therapy is individually selected for each patient. It aims to help children with MPD become independent in everyday life as much as possible. therapists cooperate with the patient, his carers, other specialists who care for him, building a therapeutic program, based on the latest scientific research in the field of neurology, physiology, orthopedics and other sciences. At the base of this procedure lies, among others, normalization of the size and distribution of muscle tone, the release of postural and movement patterns from the influence of abnormal postural reflexes (inhibition), simultaneous facilitation (paving) of patterns based on corrective and equivalent reactions. The starting point of the therapy is always a thorough assessment of the child's condition, carried out according to a special scheme developed for the needs of the method. Based on the result of this assessment, among others, position for exercises, appropriate braking and paving techniques, and exercises themselves, which are usually modified during their performance (according to the child's reaction) [10].

The aim of the study is to assess the type and frequency of disturbances in the processing of sensory processes in infants with motor-related disorders of central origin. The study also investigated the impact of NDT-Bobath improvement on the development of sensory integration.

MATERIAL AND METHODS

The research was conducted with 43 children from Świętokrzyskie centers dealing with the so-called early intervention. The group consisted of 26 boys and 17 girls aged 4-12 months. These children were referred to physiotherapists by pediatricians or pediatric neurologists due to the occurrence of movement disorders of central origin. None of them had a chronic disease called somatic their main physical condition was good. The main symptoms included postural asymmetry found in 19 cases, postural hypotension in 31 cases and delayed psychomotor development found in 23 infants. The vast majority of respondents (68%) had several of the symptoms listed above. The children were improved by the NDT-Bobath method. Exercises with the therapist were carried out on average 4 times a week for 30 minutes, in addition, parents performed at home a selected exercise on average 6 times a day. Parents also used neurodevelopment care - proper lifting, carrying, correct position changes and proper feeding - according to instructions provided by the physiotherapist and neurologopedic. The effects of rehabilitation were assessed twice over a four-month period (study I and study II). Most children remained in further therapy due to the presence of deficits in various spheres of development.

The tests used the Test of Sensory Functions in Infants (TSFI) published in the United States, whose authors are Georgia A. DeGangi and Stanley I. Greenspan. The test serves to assess the disturbances of sensorimotor integration as well as the risk of their occurrence in children aged 4 - 18 months. It consists of five subtests that enable the assessment of the functioning of the basic senses by observing the following features: sensitivity to deep pressure; the level of adaptive motor functions; visual-tactile coordination; control of eye movements and the level of integration of vestibular information [10].

Based on the number of points obtained in each of the subtests, infants were qualified according to the norm group, risk or deficit in accordance with the score provided for a given age group (Table I).

The test was carried out twice. The first time before the beginning of rehabilitation (study I) and the next one after three months of therapy (study II).

Table I. Test and subtests score dependig on age range

Subtest	**4 – 6 msc**			**7 – 9 msc**			**10 – 12 msc**			**13 – 18 msc**		
	Standard	Risk	Deficit	Standard	Risk	Deficit	Standard	Risk	Deficit	Standard	Risk	Deficit
WDN	9-10	8	0-7	9-10	8	0-7	9-10	8	0-7	9-10	8	0-7
AFM	7-15	6	0-5	11-15	10	0-9	14-15	13	0-12	15	14	0-13
IWD	4-10	3	0-2	9-10	7-8	0-6	9-10	7-8	0-6	9-10	7-8	0-6
CRO	1-2		0	2	1	0	2	1	0	2	1	0
WSW	10-12	9	0-8	10-12	9	0-8	10-12	9	0-8	11-12	10	0-9
Overall resukt	**33-49**	**30-32**	**0-29**	**41-49**	**38-40**	**0-37**	**44-49**	**41-43**	**0-40**	**44-49**	**41-43**	**0-40**

WDN - sensitivity to a deep touch pressure
AFM - adaptive motor functions
IWD - visual-tactile integration
CRO - control of eye movements
WSW - sensitivity to vestibular stimulation

RESULTS

The results of the test conducted during the first study showed that out of 43 children assessed, only 8 (19%) presented the level of sensorimotor integration in the scope of the standard. Another 15 children were at risk and 20 respondents (46%) were deficit in the discussed area.

After four months of therapy in children, there was a significant and statistically significant improvement. The level of the standard was reached by 23 subjects, which constitutes 53% of the whole group (34% more than in the first study). The risk group increased slightly, ie 17 children. As regards the deficit, only 3 children remained (39.5% less than in the first study) (Table II).

Table II. TSFI - test general results in 1st and 2nd research

	STUDY I		STUDY II	
	N	%	N	%
Standard	8	19	23	53
Risk	15	35	17	40
Deficit	20	46	3	7
All	43	100	43	100

In the "touch sensitivity deep pressure" subtheme, in the first study, 40% of children were in the normal range and 17% in the risk area. 39% of the respondents were deficient in sense integration. In the second deficit study, only 5 children remained, which is 12% of the group. Three children were at risk (7%). The standard level was reached by the remaining 35 subjects (81%), which is 41% more than during the first examination (Table III).

Table III. Results of 1st and 2nd research - subtest reactivity to tactile deep pressure (RTDP)

WDN	STUDY I		STUDY II	
	N	%	N	%
Standard	17	40	35	81
Risk	9	21	3	7
Deficit	17	39	5	12
All	43	100	43	100

In the subtest on adaptive motor function when the first survey 12% of children were in the group of standards, 39% at risk. The remaining 49% of the deficit was manifested in a range of functions. After four months of therapy results developed as follows: 74% of patients were group normal 16% to a risk group and 10% deficit group (Tab. IV).

Table IV. Results of 1st and 2nd research - subtest adaptive motor functions (AMF)

AFM	STUDY I		STUDY II	
	N	%	N	%
Standard	5	12	32	74
Risk	17	39	7	16
Deficit	22	49	4	10
All	43	100	43	100

The level of integration of visual-tactile in the first study, 28% of the children was in the normal range. The risk of disturbances manifested 42% of the group. In 30% of the respondents stated deficit integration of visual-tactile. In the second study, the results change

significantly, ie. Within the normal integration of visual-tactile concerned 81% of children, 16% - at risk, and only one child showed a continued deficit. More than half of the respondents reached standards. The results are shown in Table V.

V. Results Table I and II studies subtest: integration of visual-tactile.

Results of 1st and 2nd research - subtest: visual-tactile integration (VTI)

IWD	STUDY I		STUDY II	
	N	%	N	%
Standard	12	28	35	81
Risk	18	42	7	16
Deficit	13	thirty	1	3
All	43	100	43	100

Control of eye movements prior to the start of therapy in 16% of children was at the level of standards. In terms of risk were się42 9% of children and the deficit further 42%. In the second study after four months the standard reached 80% of respondents. The risk group were 11% and 9% deficit group of children (Tab. VI).

Table VI. The results of the study I and II subtest in the control of eye movements.

Results of 1st and 2nd research - subtest ocular-motor control (OMC)

CRO	STUDY I		STUDY II	
	N	%	N	%
Standard	7	16	34	80
Risk	18	42	5	11
Deficit	18	42	4	9
All	43	100	43	100

When assessing sensitivity to stimulation westybularną in the first study, 49% of children reached the standard, 16% were in terms of risk, while 35% manifested deficit. A study conducted again after four months of therapy presents significant differences in the distribution of subjects. As regards the standard there were 86% of children; 5% were at risk, and 9% of the children presented a deficit. (Tab. VII).

Table VII. Results I and II studies subtest "westybularną sensitivity to stimulation." Results of 1st and 2nd research - subtest reactivity is vestibular stimulation (RVS)

WSW	STUDY I		STUDY II	
	N	%	N	%
Standard	21	49	37	86
Risk	7	16	4	9
Deficit	18	35	2	5
All	43	100	43	100

CONCLUSIONS

1. Abnormal processing of sensory integration processes are a significant problem in children with movement disorders of central origin.
2. Therapy NDT-Bobath method enables stimulation of sensory integration in the group of children.
3. Stimulation of sensory processing in children should focus on individual test results TSFI.

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