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The Montessori-therapy in a complex treatment of early-age children
having disorders of the Central Nervous System

From the birth and till the age of three a child is developing at a very rapid pace. This idea was already expressed in the earliest theories of infant's development by A.Gasell and became generally recognized.

Later on with the help of the experimental data it was shown that child's pace of development is gradually descending as he/she becoming mature (A.Gasell, W. Shtern).

With rapid pace of child's development any divergences from the normal process or lags in the appearance of the primary mental functions and qualities cause the high probability of accumulation of the negative tendencies in the development and deepening of the defects a child already has. The evolution of the cerebrum takes place due to the various stimuli that enter it through the sensory organs from the external environment.

A rapid pace of infant's development is the most important and typical feature of this stage of development. And this allows us to formulate very important laws of infant's development:

- different developmental areas are closely interconnected and interdependent in the generic pattern of child's development;

- early age is sensitive for child's development, he/she distinguishes high perceptibility to social and developmental influences;

- early age is sensitive to the influence of the biological and social harmfulness on a child;

- high sensitivity to therapeutic and correctional exposures and influences is typical of early age, that's why the efficiency of the therapeutic pedagogy (therapy) for children, having developmental disturbances, is very high.

Thus when dealing with developmental disturbances, the most of attention must be paid to work with infants since early age is the most favorable period. In the report the results of the use of the Montessori-therapy in work with early-age children having disorders of the Central Nervous System in the centre of medical rehabilitation for children with psychoneurological diseases «Tonus» (Brest, Republic of Belarus) are going to be produced.

The central place in the theory of Mary Montessori is devoted to the «*the concept of sensitivity periods*» or critical periods in the child's development. This periods are regarded as genetically programmed, when a child is striving for mastering some skills and at this time, according to Montessori, mastering abilities for certain skills are revealed. It's the sensitivity periods that are the most favorable in order to teach certain skills and habits and «if a child does not have the possibility to do what he/she wants in time, defined by the nature, certain abilities for mastering certain skill will disappear and that, in turn, will affect the whole process of development» (Montessori, 1949).

The concept of sensitivity periods makes it possible to describe child's development from the birth till the age of six and the age period from the birth till three was determined, in turn, as the most sensitive period. However, distinguished age limits were not defined.

Sensitivity period to order: lasts *during the first three years of life*. A child experience urge for object regulation, it pleases him/her to put objects on their places, if objects are not on their places, he/she is indignant and demands that you put them back into place.

Sensitivity period to details: overlaps the age period *from 1 till 2*. At this age children focus their attention on the minute details of the surrounding objects. Earlier his/her attention was attracted by major details striking details, at present he/ she is interested in the reality of objects and this fact perplex adults.

Sensitivity period to hand mastery: overlaps the age period *from 1,6 till 3*. This period is connected with the development of hand mastery skills. At this age period children always grab something, they are pleased to work with their hands, they open and close something, fold and unfold, build anything using different objects.

Sensitivity period to walking: *the end of the first – the beginning of the second year of life*. Montessori said that the acquirement of walking skills is like to be born for the second time. Thanks to walking a child turns from helpless creature into active member of society. In their indefatigable attempts to walk children act under the influence irresistible impulse, and the better they walk the more proud of themselves they are. A child adopts more and more new means of walking and makes numerous attempts in mastering of new means.

Sensitivity period to speech: *the age period till three* is called the period of unconscious speech mastering. The tempo of speech mastering is really unbelievable since speech is a very complicated process. Without a thought a child master difficult grammatical structures and begins to apply them soon. On the basis of this extraordinary mastering ability, Montessori concluded that a child must possess a certain «mechanism of language perception» – a child learns language unconsciously. The process of language mastering is very similar to its printing in memory, at the age from 2 till 3 children are inwardly ready for the perception of sounds, words and grammatical constructions.

Thus, according to Mary Montessori, the early-age is the peak sensitivity period for a child. The Montessori pedagogic system is directed at the development of various child's sides, that's why it can be efficiently used in complex treatment of early-age children having disorders of the Central Nervous System. The therapeutic Montessori pedagogy makes it possible to influence all the areas of child's development in early childhood.

Psychic development during the first three years has a complicated structure, which includes the following areas :

- motional development
- the development of manual skills and manipulations with objects
- cognitive development
- the development of speech understanding
- speech development
- social development
- the development of self-dependency.

While planning the work with early-age children, we had to pick out the suitable material for the therapy. To the main Montessori-set we added other materials corresponding to developmental tasks of early-age children, to correctional tasks of motor disorders and disturbances of development.

Characteristic of children's developmental disorders at an early age

Children with central nervous system injury have different disorders of moving and mental functions: basic movements, hand movements, and grasping, operations with objects, communication with adults, orientation in the outward things, cognition, speech understanding and their own speech, game and self-service skills. As a rule, children have multiple disorders because all the spheres of development are interrelated. Therefore, while organizing work with children our attention should be paid to the necessity of developmental disorders' correction in all spheres.

The structure of nervous system diseases and psychoneurological diseases of children of first three years who undergo a course of complex medical treatment at Brest medical rehabilitation centre for children "Tonus" (for 9 months in 2009)

Total number of children : 468

Out of them : 0 - 1 years old – 156

2 - 3 years old – 312

Cerebral palsy – 158

Mentally retarded, developmental delay, autistic disorders - 310

The following **Montessori materials** were used to work with infants:

1. Practice of practical life skills

- ✓ setting up with a spoon;
- ✓ interspersing with jugs;
- ✓ frames with stickers, zippers, press-buttons, big buttons;
- ✓ sweeping, dusting, hands' washing and washing of a table;

2. Sensory material:

- ✓ blocks with cylinders;
- ✓ the pink tower, the brown stairs;
- ✓ colorful plates(box 1 and 2);
- ✓ exercises on sorting;
- ✓ a demonstration frame;
- ✓ a geometrical commode(frames with circles, triangles, rectangles and a square);
- ✓ small shaggy boards;
- ✓ small noisy bottles (3 contrasting pairs);

3. Speech development:

- real objects and their reduced replica;
- images of objects;

Additional and adapted material was also selected

Material for infants being used to enrich sensory experience

(the first year of life)

1. Sets of rattles producing different sounds according to the timbre and loudness; music instruments (a tambourine, a drum, cymbals); rustling materials for sound stimulation/
2. Sets of materials varying by touch; dry pools for haptic stimulation/
3. Light instruments and fiber optics.

Materials for carrying out actions with objects:

1. to pull a string: cars, wheel stretchers with ribbons;
2. threading – taking off from a pin: vertical or horizontal pins with rings, bricks of various size and colour, pyramids;
3. opening – closing: containers with different covers, cases with doors, boxes;
4. taking to pieces and putting together: folding constructions such as Lego;
5. throwing objects of different shape and size in containers with different diameter of a neck;
6. playing modules with different buttons, locks, handles;
7. instrumental activities: to hammer, “to fish” with a fishing-rod;
8. designing: out of blocks and bricks according to the example, out of geometrical figures, pictures in two parts.

Materials for sorting/grouping objects:

9. objects being used for sorting differ according to some characteristics: such sets as balls-shells, goats-foxes, chestnut-balls, etc.
10. objects being used for grouping differ according to one characteristic (colour, shape).

Montessori therapy course duration was 3-4 weeks. During this period of time each child received from 9 up to 15 lessons, on average – 12 lessons. The duration of each lesson varied from 20 to 30 minutes according to the child's age. The results of Montessori therapeutics pedagogy on 52 children at the age from 4 months to 3 years and 4 months are described in the report.

SPECIFICITY OF THE MONTESSORI-THERAPY FOR EARLY-AGE CHILDREN

1. To the most important part of the therapy in the early-age belongs sensory stimulation. Sensory stimulation is applied to all children at the age of one and to elder children, having motional disturbances.

2. At early-age the choice of material is very important and it must be deliberately carried out. Early age children, having disturbances of development:

- a) are having motional restrictions,
- b) are distinguished through lowered learning activity,
- c) the so-called field behavior is typical of this age, that's to say the dependence of child's behavior on the surroundings, children are unbraked and chaotic in their behavior, if they see a lot of aids and toys, in particular;
- d) are not able to choose themselves. That's why we offer the following material choice sets:
 - 1) A teacher chooses materials and sequentially offers them to a child;
 - 2) The same variant, but at the end of the class a child him/herself chooses material once ;
 - 3) At the end of the course a child and a teacher choose material by turn.

3. **The choice of the place:**

- 1) a child is placed on the special chair and fixed in the position convenient for classes;
- 2) a child is placed on the carpet in the definite position, a parent can also hold him/her, if he/she still sit unsteadily; in this position the shoulder girdle is relaxed, and hands are ready for working with the material.

4. **The duration of a class:** a child is busy with the material till he/she loses interest or turns to senseless manipulations with the material, which also indicates the loss of interest. The main indicator the duration of a class is the child's interest and his ability to concentrate attention.

5. **A teacher's conduct:** he/she emotionally addresses a child, which helps to attract attention and stir his/her interest. A teacher uses praise, approval for successful, right and carried out by him/herself actions. Praise for successful and right *modi operandi* helps a child to brush them up and encouragement of independent actions favors the development of initiative and self-dependency.

SENSORY STIMULATION OF OF FIRST YEAR CHILDREN

During the period of prenatal development and early infancy a child learns to perceive different stimuli of external environment and experiences diverse sensations. These stimuli, affecting a child, favor the improvement of the overall condition, stimulate the development of the cerebrum and ensure its readiness for action. The main content of mental development during the first months of life is the development of all sensory receptors and their growing capacity to receive and

process much more complicated external stimuli, also the development of cooperation of several sensory receptors.

External stimulation is carried out according to the two main closely connected directions.

Firstly, external stimulation is the result the child's own activity, who watches, hears, touches the objects, moves around under the influence of his/her own needs;

secondly, it is the result of the special organization of «the flow» of external stimuli by a teacher: a child is offered stimuli of different modality, moved around and taught to perceive these stimuli.

For stimulation of brain maturation of children having central nervous system damages there is need in external stimulation from the periphery of sensory receptors. Child having central nervous system damages has lowered motional and learning activity from the very birth: the need in impressions is lowered, reactions from all sensory receptors are delayed, main actions are developed later and with divergences. That is why it's important to organize additional external stimulation for such a child. A child is unable to pick out the stimuli needed for his/her brain, he/she prefers to react to the stimuli perceived by safe sensory receptors and avoid those received by partially damaged sensory receptors. Certain groups of stimuli a child can deliberately avoid since they cause hypersensitivity in him/her. That's why the range of stimuli needed for a child's normal development, but available for a child having central nervous system damages, is restricted.

The selection and stimulus presentation occur in two ways: 1) in case stimulus reaction is missing or the reaction isn't strong enough, intensive stimuli should be put forth; in case reaction appears, the intensity of stimulus is decreased in order to cause reaction to the stimuli of weak intensity. 2) in case reaction to sensory stimuli is very strong, as a rule, negative (hyperesthesia or hypersensitivity), the stimulus intensity should be minimal at first, but should gradually descend, and as a result adaptation of a child to too strong stimuli takes place.

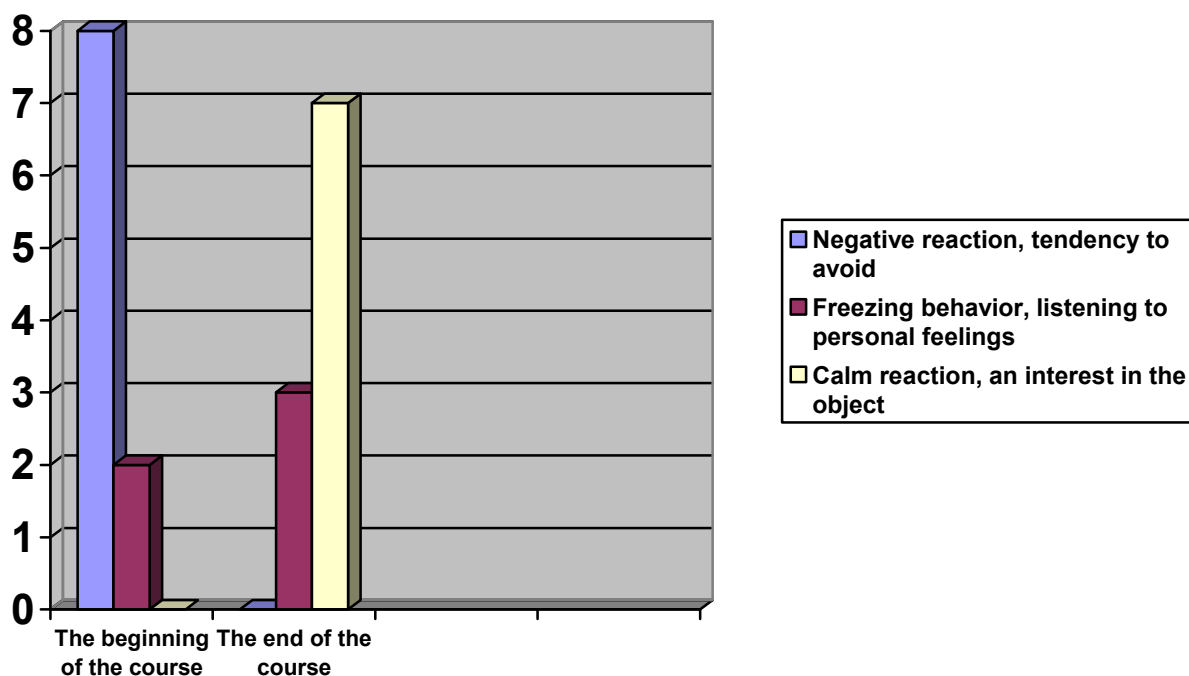
During one class a child is given the stimuli of different modalities, modalities, in turn, are alternated with one another. A child sees objects, hears sounds coming from different objects and a man, feels touches of materials of different texture and temperature, inhales various smells, feels his/her body moving around and etc.

The duration of a class – 20-30 minutes.

Here follow assessment results of sensory stimulation influence on 10 children at the age of one.

REACTION OF CHILDREN ON SENSORY STIMULI

	The beginning of the course	The end of the course
1: Negative reaction, the strive to avoid	8	0
2: Freezing behavior, listening to your own sensations	2	3
3: Reacts in a calm way, is interested in the object	0	7
TOTAL	10	10



Thus, as a result of sensory stimulation some positive changes have been observed in children: the negative reaction on sensory stimulus has been replaced by the child's interest to the object, the desire to investigate it.

THE IMPORTANT AIM OF OUR WORK: the evaluation of the effectiveness of Montessori-therapy in working with early-age children with disorders in development. It is usually used the method of control group to assess the effectiveness of medical methods. But we are faced with a serious problem - the problem of creating a control group. There are reasons why the control group can not be created:

1 - children of a certain age with certain disorders (concerning diagnosis and severity) receive the treatment (it means in the experimental groups). That's why it is necessary to evaluate the effectiveness of therapeutic pedagogic at those children who had treatment but not at children of special age with concrete disorder.

2 - a control group should consist of children selected according to certain parameters so that it repeats the experimental group on the composition (the number of children of a certain age, by the age of children, by the type of disorder, the severity of disorder); It is impossible to gather such group or it would take a long time, perhaps years.

3 - ethical, moral reasons: professionals know that the child need a help, but they do not help him, because they should assess how he would develop in an environment where the help is not provided. There is the question: why are some children provided with special assistance, and the other children - no?

4 - the children who do not have disorders in development cannot be taken as a control group, because the comparison of the results of experimental and control groups would be then incorrect.

All these considerations made us to believe that it is appropriate to evaluate not the effectiveness of Montessori-therapy, but the achievement of the child in Montessori-therapy. In other words, we assessed *the changes* that have happened with children during the Montessori-therapy, what achieved the child for a short period of time (3-4 weeks).

Let me present the

ASSESSMENT METHODOLOGY OF CHILDREN'S ACHIEVEMENTS

1. There was developed a system of indicators, which showed the child's progress when working with material. It was based on the levels of representation for the child during the therapy, in work with the material. The concept of levels allows us to speak not only about the material with which the child had worked, but what he had done with the material, in what way he had worked with it.

The concept of "level" denotes the degree of advancement of the child from simple to complex, from imperfect way of doing things with the material to more perfect one.

The concept of "level" can be applied to the characterization of child's communication with the teacher, with parents, to assess the child's interest to the lessons and so on. The concept "*the level of implementation of the action*" can remove the restrictions on the assessment procedure, which are caused by the fact that different children during the study worked with different materials. The choice of materials depended on the child's age, the severity of disorders, his interests.

The example: an indicator «the child's interest to the lessons»:

The level	The characteristic of the interest
The 1 st level	no
The 2 nd level	weak
The 3 rd level	middle
The 4 th level	high

"The modus operandi of the child with objects" (for example, toys such as "pin and the object with a hole", a pyramid, containers with lids, boxes with doors, a car with a lace)

The level	The characteristic of action
The 1 st level	The manipulation with objects or similar actions with objects in spite of his qualities: he takes them with arms, knocks, shifts from hand to hand, throws
The 2 nd level	Actions like disassemble (to take off, to take, to open, to pull out)
The 3 rd level	Purposeful attempts to link the objects with each other
The 4 th level	Independent correct full execution of the correlated and gun action

2. For each indicator, the child was assessed twice: at the beginning of the Montessori-therapy and at the end of the Montessori-therapy. The estimation was realized by psychologist together with Montessori-teacher. In assessing the child's achievements was determined, whether the child remained at the same level or moved to a higher level.

3. Each child was assessed twice by the Munich functional developmental diagnostics. It was calculated the number of children, whose developmental age increased by more than 1 month. We discussed in the next way: a child was engaged in Montessori-therapy less than 1 month, that's why under normal conditions, without therapeutic

intervention, his developmental age is also expected to increase by a month. However, if during this time the child's index of developmental age has increased by more than 1 month, then that is a testament of his development in the context of therapeutic intervention and can be interpreted as the effect of Montessori-therapy.

CHILDREN'S ASSESSMENT RESULTS IN THE MONTESSORY-THERAPY

1. Assesment results of general and learning activity

Level	The beginning of the course	The end of the course
1: Passivity	22	3
2: Average level	27	40
3: Hyperactivity	3	9
Total	52	52

2. Assessment results of the child's level of interest in the class

Level	The beginning of the course	The end of the course
missing	6	0
weak	21	6
average	4	31
high	4	15
Total	52	52

Data differences at the beginning and at the end of the course are not random (criterion χ^2 , $p=0,01$, $\chi^2_{critical}=13,277$, $\chi^2_{empirical}=22,76$)

3. Assessment results of the relations between a child and a pedagogue

	The beginning of the course	The end of the course
1: Fear, anxiety, disinclination for communication	31	0
2: Come into contact, accept teacher's proposals	19	46
3: Openness, displaying initiative in communication	2	6
Total	52	52

4. Assessment results of the child-parent relations

	The beginning of the course	The end of the course
1: Symbiosis, pathological affection	11	1
2: Stays in the room in the parents' presence	31	25
3: Stays in the room by him/herself	10	26
Total	52	52

5. Indexes of child's developmental age at the beginning and at the end of the Montessori-therapy session

(According to Munich functional diagnostics of development)

The number of children	The number of children assessed	The number of children, whose age of development has increased in more than one month The quantity is given in the percentage	The number of children, whose age of development has not changed The quantity is given in the percentage
The area of development according to MFDD			
The age of walking	50	2/4	48/96
The age of manual skills	50	19/38	31/62
The age of perception	50	24/48	26/52
The age of speech understanding	48	16/33,3	32/66,7
The age of speech	50	5/10	45/90
Social age	50	10/20	40/80
The age of self-dependence	44	6/12	38/88
TOTAL		82/24 %	260/76%

Data differences of the children's developmental age are not random.

(criterion χ^2 , $p=0,01$).

According to the table data 24% of developmental age indexes have improved more than in one month. The most significant changes have occurred to the perception age index, manual skills index and speech understanding index. Forty children (80%) have shown changes in at least one of the developmental age index, that's to say only 10 (20%) children haven't shown any changes in the developmental age index. As a rule, such children are having serious disturbances of development.

**6. Assessment results of the modi operandi with the objects
in the Montessori- therapy.**

*(Toys like «pin and holed article», pyramid, containers with covers,
hatched boxes, laced car)*

The level of execution of action (modus operandi with the object)	The beginning of the course	The end of the course
1: Manipulations	31	0
2: Actions like disassemble	15	17
Purposeful attempts to connect two objects with each other	2	26
4: Carries out correlating and instrumental actions by him/herself	0	5
TOTAL	48	48

Data differences at the beginning and at the end of the course are not random (criterion χ^2 , $p=0,01$, $\chi^{2critical}=11,345$, $\chi^{2emperical}=45,78$).

Not a single child remained at the same level of development, all children have reached the higher level. The main achievement: children are moving from simple primitive manipulations with the objects to much more complicated modi operandi.

**7. ASSESSMENT RESULTS OF SELF-SERVICE SKILLS
DEVELOPMENT IN THE MONTESSORY-THERAPY**

*(setting-up with the spoon, the frame with pins, lacing,
buttoning/unbuttoning, flypaper)*

The level of carrying out of the action	The beginning of the course	The end of the course
1: With the significant help of an adult	26	6
With the partial help of an adult	11	19
3: Completely on his/her own	0	12
TOTAL	37	37

Data differences at the beginning and at the end of the course are not random (criterion χ^2 , $p=0,01$, $\chi^2_{critical}=9,21$, $\chi^2_{emperical}=29,9$).

10 children have remained at the same level (27% of cases)

15 children have moved from level 1 to level 2	}	Altogether 27 (73%)
7 children have moved from level 2 to level 3		
5 children have moved from level 1 to level 3		

**8. ASSESSMENT RESULTS OF FORMATION OF
CORRELATING ACTIONS**

(inserting cylinders, a frame with circles, the pink tower, the brown stairs, geometrical commode)

	The beginning of the course	The end of the course
1: Random trial method	27	2
2: The method of overall orientation	14	2
3: Purposeful trial method	20	31
4: Partial visual correlation	9	19
5: Visual correlation	1	17
TOTAL	71	71

9. ASSESSMENT RESULTS OF DEVELOPMENT OF SORTING

<i>IN THE MONTESSORY-THERAPY</i> The level of carrying out of the action	The beginning of the course	The end of the course
1: Grouping (sorting) is missing	4	0
2: Unstable, with the help of an adult	20	7
3: On his/her own, without mistakes	0	17
TOTAL	24	24

Data differences at the beginning and at the end of the course are not random
(criterion χ^2 , $p=0,01$, $\chi^2_{critical}$ critical index=9,21, $\chi^2_{empirical}$ =27,2).

3 children have remained at the same (2nd) level, 21 children (87,5%) have moved one level higher.

9. ASSESSMENT RESULTS OF MASTERING OF SENSORY STANDARDS

The level of carrying out of the action	The beginning of the course	The end of the course
1: Chooses the similar object upon a model («give me the similar one»)	2	0
2: Groups objects according to the shape, color, size	12	3
3: Points at the named attribute of the object	2	11
4: Indicates the attribute him/herself (color, shape, size)	0	2

Data differences at the beginning and at the end of the course are not random (criterion χ^2 , $p=0,01$, $\chi^{2critical}=11,345$, $\chi^{2emperical}=15,6$).

SUMMARY

1. The therapeutic pedagogy or the Montessori-therapy can be successfully applied to early-age children having disorders of the Central Nervous System.

2. When organizing classes on the therapeutic pedagogy, tasks of a child's development and correctional work with children having disturbances of development must be taking into account. In other words, a pedagogue should be task-oriented.

3. As a result of therapeutic pedagogy early-age children having disorders of the Central Nervous displays the following:

- growing interest in classes, materials,
- growing general and cognitive activity,
- fear, anxiety in the communication with a teacher is taken away with, a child comes into contact, accept proposals and demonstrates openness for communication,
- descending pathological affection to parents, growing independency,
- growing indexes of developmental age in different spheres, in perception, in development of manual actions and independency, in speech understanding.
- developing modi operandi with objects,
- developing self-service skills,
- developing cognitive capacities.

The therapeutic Montessori-pedagogy applied to early-aged children shows its high efficiency.