

SENSORY DEVELOPMENT OF SENIOR PRE-SCHOOLERS WITH DEVELOPMENTAL DELAY BY MEANS OF MONTESSORI MATERIALS

^aDOLORES ZAVITRENKO, ^bIRYNA SNISARENKO,
^cLILIA KLOCHEK, ^dANATOLIY RATSUL, ^eTETIANA
OKOLNYCHA, ^fLESIA KINDEI, ^gTETIANA RUDENKO

^{a,c,d,e,f,g}Volodymyr Vynnychenko Central Ukrainian State
University, 1, Shevchenka Str., 25006, Kropyvnytskyi, Ukraine.

^bDonetsk State University of Internal Affairs, 1, Velyka
Perspektyvna Str., 25015, Kropyvnytskyi, Ukraine.

email: ^azavitrenkod@gmail.com, ^birynasnis72@gmail.com,

^cklochek155@i.ua, ^da.b.ratsul@cuspu.edu.ua,

^et.vladimirovna.75@ukr.net, ^flesyakindei@gmail.com,

^gvrud35@gmail.com

Abstract: The results of the research of etalon images formation in pre-school children with developmental delay are analyzed. The authors focus on sensory models development in children with mental development delay (MDD), also define the main directions of sensory models development in senior pre-school age children with MDD by means of Montessori materials. Classes are conducted in specially prepared environment. As Montessori approach requires the division of the activity room into several zones, standard ones are considered to be: natural zone, practical life zone, sensory zone, language zone, and mathematical zone. The task of a teacher is to adjust to the kid's interests. It is important to create the environment for realization of his or her ideas and actions.

Keywords: mental development delay, sensory education, Montessori materials activity.

1 Introduction

Mental delay involves the entire mental sphere of the child, and is essentially a systemic defect, so the process of learning and education must be built from the standpoint of a systemic approach. The meaning of this paper is to outline a full-fledged basis for the formation of higher mental functions and provide special psychological and pedagogical conditions necessary for their formation. Purpose of the paper is to find out - ways of adaptation of children with developmental delay to the regular educational regime, as well as - methods of organization and planning educational activities, taking into account the needs of studied group of children. The main method used in our research is the method of cooperation based on the use of games, joint projects, experiments, and group tasks.

As S. Agostine et al. (2022) claims participatory sense making is one means of supporting purposeful sensory experience and patterns of sensory processing, which is vital to support children with severe disabilities in independent play and sense making. Interacting with toys in any way they independently can explore their environment by touch, sound, mouth, or vision; it should be combined with learning through the process of engaging with others to support their efforts to pursue desired outcomes or complete tasks. These are just as important and meaningful for children with severe disabilities as they are for any child.

Sensory disorders can cause poor balance, dislike of touch, dyslexia, poor expression, and inattention, and are mainly classified as tactile disorders, proprioceptive disorders, vestibular balance disorders, language disorders, and spatial and auditory disorders. These disorders are very detrimental to the healthy development of the individual child and are prone to lasting and widespread adverse effects (Jinting et al., 2023). /.../ given their emphasis on individualized instruction, child-directed learning with self-corrective materials, and teachers acting as motivators and facilitators of learning rather than didactic instructors of specific skills, Montessori classrooms may provide the ideal environment in which to implement inclusion (Long & Ferranti, 2022, p. 20). Being a follower of classical humanism, Montessori managed to formulate the concept oriented to the personality of a child in its center, to the assurance of a child's capabilities to achieve success. And even more: the system allows a child to develop thanks to independent activity.

The central idea of Montessori's teaching is based on the need for the pedagogue to create a subject-spatial environment in which the child could fully reveal his inner potential in the process of free independent activity. This environment should allow each child to develop at his or her own pace. The task of the educator is primarily to provide the child with the means for self-development and to reveal the rules for their use. Such tools are the autodidactic (self-learning) Montessori materials with which the child works, first acting according to the pattern, and then - performing the exercises independently (Dudnyk, 2017).

Maria Montessori is an Italian doctor and pedagogue who dedicated all her life to children. Working with disabled children she managed to build up a system which allows to improve motor and sensory skills of a child. In the process of studying the teacher appears to be an assistant, and a mentor for children. Montessori's method is recognized as the most requested one in modern pedagogy, the fact being confirmed by the number of educational establishments which follow it. The main principles of this approach are maximum of wish, and minimum interference into the process of natural development of a child. Every year, schools and nurseries which work with Montessori's system, are gaining popularity, as many parents dream for their children to be educated in the environment which promotes dynamic development of every kid. The first elaborations by M. Montessori were oriented to the development of sensory perception and motor skills of a child.

Modern Ukrainian educational community faces the choice of psychological teaching techniques which are personally-oriented, and which can satisfy all state demands connected with pre-school child development. This demand is reflected in the theory of free education which appeals for emotional well-being maintenance through personal-oriented approach to every child, namely, respectful attitude to his or her feelings and needs.

The program "Montessori nursery school" includes the following thesis (Montessori, 1912): – personal-oriented educational model: Montessori-pedagogue follows the mental and physical health of every nursing; – education of an all-rounded personality: in a Montessori nursery school a child becomes acquainted with the world on all its manifestations; – inheritance of goal marks: development of self-dependence and self-initiative in various activities, development of imaginative thinking; – arranging of developmental objective-spatial environment: corresponding Montessori-materials are selected according to each content-related educational area. Implementation of the program in pre-school organizations, as well as systems of work, and Montessori-materials will provide proper and all-round education. /.../ without constant development of sensors, it is impossible to get to know the peculiarities of the natural and social environment and their sensory characteristics. Sensory education is closely related to the mental development and upbringing of adolescents. It appears as its basis, since sensory education takes place in the process of various types of children's developmental activities: work in nature, construction, drawing, application, etc. which require the active participation of both sensory and mental processes. Sensory education is of utmost importance for the proper functioning of thought processes (Doncheva et al., 2022, p. 36).

2 Literature Review

In modern literature the issues concerning sensory education of pre-school children with developmental delay, and the influence of Montessori-materials on sensory models development, within the framework of developmental correctional work of pre-school children with MDD, are acquiring *special topicality*. Sensual experience is the first step in perception of surrounding world. It is sensory education which is directed to the development of overall child's perception of the space around him/her.

Successfulness of cognitive, physical, and aesthetic education is dependent on the level of children's sensory development the latter playing a great role in psychological, and social formation of a personality. Sensory development of a child is the development of perceptions about environment objects features: their form, colour, location in space, sounding, and even taste. Pre-school age is considered to be the most intensive period of sensory development as it is the period of improvement of orienting-spatial perceptions.

Peculiarities of sensory development of pre-school children with delay has been studied by V.V. Zasenkov et al. (2008), A.A. Katayeva et al. (2021), A.A. Kolupayeva (2010), I.I. Mamaichuk (2006), K. Panasenkov et al. (2023), Yu. Ribtsun (2015), Jenna N.Adams et al. (2015), B. L Baker et al. (2003), A. Juodraštis et al. (2008), Aznita Iryany Mohd Noor et al. (2022) etc. These authors explored that such children find orientational-scientific activity, which is pointed at the research of qualities and specifications of objects, difficult. Also, these children haven't yet formed the notions of the form, colour, and size. They don't differentiate between a ball and an air balloon, between similar in color objects, they are not able to arrange the objects in order of size. The main problem appears to be in the fact that their sensory experience is generalized more slowly, and is not fixed in a word; there are mistakes in naming color, form, and size peculiarities, all these marking non-formation of model imagination in these children.

Senior pre-school age children are slow to learn and understand new, unknown material. In order for them to learn how to become inquiry, attentive and active, to be able to acquire new material some playing methods, e.g. travel-game, may be used. The content of such games may be filled with different sensory exercises thanks to which the tasks of topical advanced systematic developmental correctional work in sensory development of children with MDD are solved. Sensory development of a child with MDD on the whole gets behind the deadline, that is why the formation takes place unevenly (Mamaichuk, 2008).

The criteria which influence sensory development of children badly are the following: – delay of movement functions which becomes vivid in slow decay of some unconditional reflexes; – slowed, and often inconsistent formation of locomotory functions such as holding the head, body overturn, sitting, uprising, crawling, treading, etc. – belated development of sight fixation which is manifested in difficulties while watching the objects; – underdevelopment of visual-motor coordination, that is belated development of sensorimotor functions; – decrease of cognitive activity; – immaturity of emotional-volitional sphere which is expressed in late appearance of a smile and the whole complex of liveliness, and in belated differentiation of emotional reactions to the environment; – delay in the development of a mentally active child (ibid.).

The problem of sensory development of a child with MDD is topical, thus requiring further research, as without modern special resource influence etalon perceptions in children with MDD will not be formed, even till the end of pre-school period, attesting ill-preparedness of children to school. The research of the problem of pre-school age children development has its tradition. The most significant investigations in this field were conducted by modern researchers V. M. Koshelev (2019), T. Krasova et al. (2021), K. Lutsko & O. Kryhlyuk (2021), V. Ya. Pupyshcheva (2015), Ye. G. Sarapulova (2015), V. Romenkova (2023), Aniyah Manja Syazwani et al. (2022), J. Paynter et al. (2023), Zavitrenko D. et al. (2022).

Instructional Montessori-materials is the phenomenon whose boundary is between workbooks, educational toys, and things of everyday routine. Anything may be used as the object of the game, specifically a chair, a plate, a spoon, a sponge, cereal, water, etc. These may be usual clothes pins, paper colourful fasteners, chestnuts used in didactic games for children which help to develop tactile sensibility, thinking, fine motor skills of hands, colour perception, memorizing of geometric objects;

these also may be different geometrical objects (bricks, cylinders, etc.), plates, tablets, frames with different colours and patterns; things with the elements of fasteners, ropes (for fine motor skills development and household habits). For three-year-old kids who sometimes can define neither colour, nor the object itself, it is better to use floppy objects with the help of which such games as "Plant the bed", "Pick the fruits" may be conducted. The task to tack a yellow flower on a yellow button, a blue flower on a blue button may be set to children. So, firstly, the notion "the same" is formed and then the flowers, and their names are memorized.

3 Materials and methods

In the process of working with children with developmental delay, we found out that they have a peculiar cognitive activity.

- In particular, all children with developmental delays have reduced attention. We found out the different nature of the decrease in the stability of attention: maximum concentration of attention at the beginning of the task and its subsequent decrease; periodic changes in the intensity of attention and its decline during the entire working time.
- Inferiority of visual and auditory perception is observed, as well as spatial and temporal disorders, lack of planning and failure to perform complex tasks. Such children need more time to absorb and process visual, auditory, and other impressions. Similar qualities of objects are perceived by them as the same (an oval, for example, is perceived as a circle).
- Also, our observation revealed that those types of memory that require frequent mental processes are particularly affected. In particular, mechanical memory is characterized by reduced productivity of the first memorization attempts, although the time required for complete memorization is close to the norm.
- With regard to thinking, quite high indicators are observed when performing tasks according to a visual sample, however, some difficulties are caused by those tasks in which there is no visual sample.
- We also found some peculiarities in the speech activity of the observed group of pupils. In particular, the vocabulary is insufficient, even poor (especially active); there are difficulties in mastering the grammatical structures, and violations in the formation of monologue speech. Such children made mistakes in distinguishing sounds, they couldn't extract sentences from the text. These features of speech activity created considerable difficulties in teaching them to read and write.

The productive time for such children appeared very short (15-20 minutes), after which fatigue occurs. Such children become distracted, not knowing where to start, asking the teacher repeatedly; going from one activity to another without finishing any of the work they have begun. So, the use of materials from the Montessori program became expedient in our study.

The program by M. Montessori accounts for a child's acquisition of form, colour, size of objects, as well as his or her development of acoustic, kinesthetic, and other sensory receptors, with the help of using different didactic games. It may be said that sensory perception is the background of harmonious development of children. Montessori-materials serve as the most important means of sensory perception of children which represent the core of studying process in pre-school and junior-school age. These materials are composed in such a way a child could update his or her practical skills and sensory capabilities.

3.1 Participants

Sensory development of children with MDD has its peculiarities which is manifested in imperfect formedness of sensory samples. In order to be certain in validation of such a conclusion we conducted a summative assessment. The research was conducted in Public municipal school "Residential educational establishment "Special comprehensive school of I-II grades № 1

– preschool educational establishment of Kropyvnytsky City Council of Kirovograd region”, Ukraine. 20 children participated in the experiment: 10 of them have sound mental health, 10 children have mental development delay.

For diagnostic assessment such methods as “Colours” technique, “Forms” technique, “Size” technique (Chebotariova et al., 2020, p. 55-57) were used. In accord with the results of this diagnostic assessment the conclusion may be made that the majority of children with MDD *do not know* sensory models, as well as the words of expression them. These children *do not use* such words either in active or passive vocabulary, their motor skills, namely hands movements, are imperfectly formed. All these confirm *the necessity of a special intervention program implementation aiming at etalon images development* in senior pre-school age children with MDD.

3.2 Procedure

Within the scope of received results we *worked out* the schedule of corrective actions directed at the development of sensory samples of children with MDD with the help of Montessori-materials. The *purpose* of suggested corrective actions is the development of sensory samples in senior pre-school age children with MDD. The main *tasks* of corrective actions concerning the development of sensory samples in senior pre-school age children with MDD are as follows:

- correction of sensory processes and coordination;
- correction of cognitive activity;
- development of motor skills;
- development of interest, and enforcement to actions;
- formation of skills to interact with subjects;
- formation of motivation to studying.

Classes with children aged from 4 to 7 were conducted twice a week. Duration – 20-25 minutes. The Program realization stages were the following: 1) March, 2023 – investigation problem diagnostics; 2) April, 2023 – elaboration of the program; 3) May, 2023 – implementation of the program in “Residential educational establishment “Special comprehensive school of I-II grades № 1 – preschool educational establishment of Kropyvnytsky City Council of Kirovograd region”, Ukraine; 4) June, 2023 – formulation of results.

The Program was divided into modules each being responsible for the development of certain sensory samples:

1. Introduction.
2. Formation of sensory samples diagnostics (Unit 1 contains 4 classes for learning basic colours; Unit 2 includes 4 classes for learning geometric figures; Unit 3 embraces 4 classes for learning size).

Observations were supplemented with work samples, instructional materials, and photographs of the classrooms. Documents such as pupil’s Individual Education Programs and curriculum requirements also contributed to the data of this study.

3.3 Ethical Criteria

The design of the research is based on the principles of respect for the individual, anti-discrimination, gender equality, validity, professionalism, and consistency of conclusions. All stages of the pedagogical experiment correspond to the generally accepted academic ethical principles of research work.

4 Results and Discussion

In order to purposefully train and correct the mental development of a child, it is necessary to know the shortcomings of the development of his/her individual mental functions, to be aware of the interconnection and interdependence between them. It is practically impossible to separate the development of

perception, thinking, memory and other functions by first forming one and then the other.

Pupils with mild intellectual disabilities have been found to have lack of formation of speech operations. Communication in their native language is only developed at a sufficient level in everyday situations. Schoolchildren construct sentences grammatically correctly, pronounce words, master reading and writing, but have difficulty perceiving speech, which consists of complex logical-grammatical constructions. In the semantic dimension, the vocabulary is rather poor, the acquisition of the meanings of words causes difficulties. /.../ there may also be a situation where speech is not formed for many years (Truhan, 2022, p. 177-178).

From *our experience* of working with these children, we have considered the following features:

- since the main characteristic of children with special educational needs is a lack of knowledge about the world around them, we focus on developing their observation skills, practical experience, and the ability to independently acquire and use knowledge;
- the most typical gaps in knowledge were identified in order to gradually prevent these children from falling behind their peers;
- knowing the lack of activity and the reluctance of children with developmental delay to operate even with the knowledge they already had, we encouraged them to be as active as possible in the classroom, encouraged even minor achievements in order to create the atmosphere of positive attitude and constant support;
- especially at the first stages of training, we used visual aids and explained even not quite complex notions in detail;
- taking into account the difficulties of memorization and impairment of working capacity in the process of performing practical tasks, the teacher additionally explains the educational material, gives the opportunity to perform the tasks at a slower pace, allows to ask additional questions for the purpose of deeper disclosure of the content of the task;
- tasks are divided into components to form the ability to plan activities and verbally report on their performance;
- the pace of work and working capacity of the child gradually increased;
- taking into account the emotional age lag of the studied group of schoolchildren, the number of game techniques in the learning process decreased gradually, without the use of sharp prohibitions;
- if necessary, the number of tasks given for independent processing was reduced.

We consider the usage of Montessori-materials at the lessons *effective as they allowed* to form such skills in children:

- 1) skills of different movements by fingers and hands while exploring things;
- 2) skills of recognizing, and naming sensory samples;
- 3) ability to be aware of space;
- 4) skills of social, and emotional response;
- 5) aptitude for sensible actions with objects.

The *results* of deadline assessment disclosed the effectiveness of corrective actions aimed at the development of sensory perceptions of colour, as far as the majority of children could not only point to, but also name both basic, and additional colours. Difficulties connected with naming geometrical objects were diagnosed in children with mental development delay, so, based on the results of the test experiment it became possible to indicate positive dynamics in the development of the idea of geometrical figures, and extension of vocabulary in pre-schoolers. On completing developmental-correctional classes the number of children with MDD, who coped with the tasks *increased*, which mark the growth of imagination of size in senior pre-school age children with MDD.

In order to increase the motivation of learning and cognitive activity in students with MDD, we *propose* to introduce a *system of exercises* into the learning process, in parallel with the use of Montessori materials that can be performed both in the classroom under the supervision of the teacher and at home under the supervision of the parents.

The first group of exercises is focused on developing attention, because children with MDD especially suffer from lack of voluntary attention when purposeful activity is required. They are called 'name the number', 'find the mistake', 'make a pattern out of sticks'.

The second group includes exercises to improve spatial perception. These include the exercises 'what objects is it made of?', 'what is where?', 'labyrinth: help find the way', 'guess what is depicted'.

The third group includes games and exercises for improving time perception: 'tell the time', 'determine the season by objects'. As we found out, the perception of time is especially difficult for children with MDD as duration, speed, and sequence of events are perceived by them with considerable effort. In games and exercises, it is more effectively to consolidate ideas about parts of the day (morning, afternoon, evening, night), days of the week, months, time-markers: before, later, first, then, before.

The fourth, the most important, group of exercises are games and exercises for the development of thinking and speech. These are the exercises 'guess the riddle', 'name the word that begins with the last letter', 'name words with opposite meanings', 'compose a short story based on pictures'. As it turned out, the use of such exercises in lessons contributed not only to the activation of mental and linguistic activity, but also to development of such mental processes as thinking, memorization, imagination.

Modern educational portals offer a variety of interactive types of work (Edx. education, 2021), which give pupils with special educational needs the opportunity to transfer previously acquired knowledge, skills and abilities to new activities and situations of speech interaction. While using of various forms of interactive activities, pupils with special needs work in a group of peers, where they can freely express their opinions, mobilize knowledge, and demonstrate creative, organizational, and leadership potential (Kazachiner, 2019, p.165). When organizing the education of children with disabilities, it is necessary to take into account the low work capacity and the peculiarities of their cognitive activity. Only if the child's psychophysiological capabilities and the difficulties he/she may face in the learning process are clearly defined, effective pedagogical conditions for child's full development can be created (Shapochka, 2007, p.135).

5 Conclusion

The results of our observation showed that the path of adaptation of children with developmental delay to the regular educational regime is long and painstaking, so it must be clearly planned and organized. The main condition here is to avoid coercion which has no positive outcome, can distract the child from learning, and provoke aggressive behavior. It is not appropriate to assign difficult speaking roles in dialogic speech, as heavy texts may be overwhelming for a child with MDD, especially when it comes to improvisation. Only later, when other children have worked through the speech material of the game, an attempt may be given to a child with MDD.

We also believe that children with intellectual disabilities, like other children with special educational needs, have the opportunity to master other knowledge, a foreign language, in particular, at least at an elementary level (greetings / farewells, naming family members, colors of objects, interior of an apartment, the simplest actions, etc., construction of simple sentences, questions, etc). Therefore, the development of ways and methods of teaching a foreign language the researched group

of pupils, as well as systems of exercises for them, we consider a promising area of work with children with special educational needs.

We find it reasonable to continue researching in the described above direction in order to prove the effectiveness of our research ways, with its further implementation into the educational process of children with MDD, as well as to implement this method for other categories of children.

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