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Pathogenic Mechanisms of Speech in Children with a Delay in Semantic Fields Formation in mastering the Russian language

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Abstract

The purpose of the study is to analyze semantic structures in children with speech underdevelopment and describe the algorithm of diagnostic research to arrange a qualitative correctional work to form semantic fields in preschool children with special needs.

Research methods include theoretical ones to study psychological and defectological works of scientists and practitioners to analyze the mechanisms of semantic fields formation in children with special needs and practical methods to study the semantic development, and the semantic field of objective activity in mastering the Russian language. These methods provided quantitative data and a qualitative analysis of the responses' results. 50 children with severe speech disorders attending nursery schools in Bataysk participated in the study.

The research results showed that children with severe speech disorders had, in general, a low level of formation in all areas under study: the volume of the passive and active vocabulary, the semantic structure of the word and lexical consistency, word formation, and the semantic field. Conclusions and recommendations. The study provides ample evidence of the need to create a structure of correctional work to form semantic connections in children with various speech disorders. The paper proposes an algorithm for studying the speech functional system of preschoolers.

The research findings could be beneficial for speech pathologists and speech therapists, educators and parents to develop preschoolers' speech, as well as for teachers to elaborate a course of lectures and seminars on teaching methods of correctional work aimed to develop the semantic side of speech in persons with disabilities.

Keywords: semantic field, mechanisms of speech, preschoolers, severe speech disorders, research algorithm.

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Introduction

The difficulty of speech function development in children with various speech disorders is connected, in one way or another, with speech understanding and problems to establish communication with adults and peers. Analyzing this issue, we have come to the conclusion that the directions of work aimed to form coherent speech, phonemic, grammatical and lexical sides of speech are associated with the state of the word meaning formation, a semantic field. Vygotsky (1982), Leontiev (1970, 1971) described the meaning of a word as a “polymorphic” phenomenon including such semantic functions as an indication of the object property, category, conceptual meaning or a “semantic field”.

Consideration of speech pathogenic mechanisms in children with a delay in semantic fields formation makes it necessary to refer to the hierarchy of speech function in ontogenesis. The general structure of the speech function includes such stages as understanding of words with a specific meaning and only then understanding of words with a generalized meaning. These skills are formed in children only after they have learnt to distinguish between non-speech and speech sounds, and then they discretely perceive the sound composition of the word (Vizel, 2016). When pathological formation of semantic fields takes place, these stages are not formed, and the vocabulary containing generalized meanings suffers to a greater extent, while the vocabulary consisting of specific meanings undergoes less trouble. This results in communicative function disorders in children, and also causes difficulties in understanding speech both at the level of the sentence and text. It is essential for us to find out the mechanisms of semantic fields formation in ontogenesis, understanding of some meanings of words, relationships between objects and phenomena. Vizel (2016) describes the process of understanding words which is implemented in the tertiary temporal cortex of the left hemisphere. Therefore, it can be suggested that in children with speech disorders, the features of semantic fields formation are associated with the peculiarities of the functioning of this section in the cerebral cortex. It is important to take into account that the process of understanding words includes not only auditory images (name of an object, verbal description of an object), but also visual images the psychophysiological mechanism of which is determined by the inclusion of visual gnosis. At present, the assessment of semantic fields formation is carried out selectively and has a rather narrow view of the state

of child's development in this aspect. This leads, in some cases, to a subjective assessment of the mechanisms of deviant development, on the one hand, and limited opportunities for intervention, on the other hand.

Purpose and objectives of the study

The purpose of the study is to specify features of semantic field formation in children with speech disorders.

The objectives of the research include a multilateral study of semantic structures, their formation in children with speech disorders, description of diagnostic research algorithm of semantic fields in preschool children with special needs in order to create a qualitative work aimed to develop coherent speech.

Literature review

Many scientists and modern practitioners agree that the problem of today's children is a low level of speech understanding. Its detailed analysis revealed that semantic fields are closely related to grammatical, morphological and syntactic categories.

According to Luria and Vinogradova (1971), the real presence of a semantic field embraces the entire dictionary since it includes words related to each other. The issue of studying semantic fields went beyond the framework of a linguistic approach long ago; scientists consider the semantics of words from the point of view of an integrated approach. The word is a complex "multidimensional" structure that includes a processed diverse experience – knowledge. Therefore, a child studying an object receives not only a verbal meaning and standard features, they also receive their own perception, understanding of the essence of this object, its relationship with other objects and personal experience contained in a single information base. A contradictory opinion can be found in the theory of Trier (1973), Ipsen (1924); they suggest that words separated from the semantic field do not have their own meanings. However, modern knowledge of psycholinguistics confirms the semantic significance of a single word and in interconnection with others, being in the semantic field and implicitly located in the quantitative composition and qualitative content (Nilsen, 2001).

Tregubchak (2019, p. 187) describes the semantic field as "a heterogeneous system containing elements of different levels of language that are interconnected and interdependent, and which perform a common function." As for the process of forming the relationship between words, one can consider Tkachuk's (2021) understanding of this process. The researcher points out a certain word order that forms groups of language units inside semantic fields and which is united by a single meaning in a certain context.

Bierwisch and Heidolph (1970) admit that the semantic analysis of a sentence and perceived interrelated words arranged in a certain sequence may be carried out by explaining the syntactic relations connecting these elements and decomposing into elementary semantic components as well. The theory that analysis of a lexical unit determines semantic markers and separators (Katz, 1966) is criticized as the described component analysis does not create a final set to describe semantic structures of the language. Among analyzed modern studies, a new semantic theory based on a unified representation of information is of great interest as it provides a new cognitive model. In light of this, every person comprehends their own world by combining and comparing all these worlds (different versions of the same world perceived by different people), creating a single system, but at the same time taking into account that all this is in reality.

Children with severe speech disorders have a lack of semantic speech formation, an insufficient vocabulary; these factors result in their incorrect use in a specific situation (Khalilova, 2001). Belyakova (2020), Mastyukova (2007) and other authors emphasize the need to develop the semantic side of speech precisely at preschool age in children with dysarthria, alalic, anatomical, physiological, and neurological disorders. Zhukova et al. (2011) draw attention to the fact that preschoolers with severe speech disorders use only the most common everyday colloquial units. Other studies (Eremina, 2014) specify that children with severe speech disorders (SSD) demonstrate a delay in speech activity standards, a poor vocabulary and a significant difference between active and passive vocabulary. Lisitsyna (2014) indicates that the formed semantic field will allow the child to quickly find the right words of his native language to express their own thoughts so as to ensure productive verbal communication with adults and peers.

Methodology

We have scrutinized different approaches aimed to diagnose semantic fields in children with speech development disorder and have chosen the method of lexical operation research (Lalaeva, 2006; Serebryakova, 2006) and the method for studying the semantic field of objective activity by Arkhipova (2007). Another side of the semantic field study is connected with understanding of the sensory image that arises when the child is involved in the process of perceiving the word, acquaintance with the object. Kovshikov and Glukhov (2007), Dridze (1980) specify that a sensory (visual) image is an “ideal carrier” of the word meaning. We have elaborated the algorithm to diagnose the semantics of the word which includes the following functions: study of the function features, i.e. signs of the object and phenomenon, names of the action of objects, determination of the word category meaning, word formation skills, determination of relationships between objects (a “semantic field” itself), study of the ability to define the center of the semantic field and its structure.

We combined the above-described approaches to the semantic field and its components analysis and identified areas of research:

- study of active and passive vocabulary volume;
- study of lexical consistency and structure of word meaning;
- study of a word formation skill;
- study of the word sensory image.

The diagnostic procedure was carried out individually. Tasks were presented in a certain sequence, depending on the level of difficulty. During the study of the active vocabulary, children were offered illustrations depicting objects and plots. The testees verbally called the words of various parts of speech: nouns, adjectives, verbs and adverbs. While studying passive vocabulary, the experimenter named a word, e.g. a plate, and the child had to show a picture among other groups, namely, dishes. The study of lexical consistency and structure of the meaning of a word included 8 tasks of different levels of complexity, from semantically close words (birds - insects) to semantically distant ones (furniture - insects). Tasks for classifying, grouping words and explaining the choice, for selecting synonyms, antonyms, inventing words for a group of other words, selecting words for a verb, adding the last word in a sentence were suggested. The study of word formation contained 7 tasks: the formation of diminutive nouns, adjectives, verbs, names of baby animals, professions, word formation by definitional type (phrases that can be replaced by one word).

For the objectivity of the results, the material was presented in a polymodal form relying on visual and auditory analyzers, as well as on sensory images of the word, giving the experiment a perceptual component. The verbal material was chosen due to the norms of the word semantics formation for a given age; their lowest and highest limits of formation were considered. The choice of visual supports (object pictures, topic pictures) was determined by a standard and variable real image of the object. Verbal associations were studied when the sensory image of a word was considered (the named word should be added by any word that was remembered).

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The results interpretation had a quantitative and qualitative character. The qualitative analysis estimated performance independence; the level of help rendered to the child, the speed of reaction to the stimulus word, the semantic similarity of the words in the answer relative to those given in the instructions, and other aspects were recorded. The quantitative analysis of responses assessed the total number of errors and the average values of task completion, the levels of semantic field formation were identified.

The experiment involved 50 5-year-old children with a general speech underdevelopment of the III level. This pathology in children of the experimental group is complicated by an expressive disorder, the cause of which is the violation of the innervation of the speech apparatus. The research participants studied in the correctional groups of the municipal budget preschool educational institution “Nursery school No. 11” in the city of Bataysk during the experiment and made up the experimental group. There was no control group due to the fact that all parents expressed a desire to have their child participate in the correctional stage of the experiment. Written consent was obtained from parents for their children’s participation in the examination and correctional work on the formation of semantic fields. The experiment was conducted on the basis of a kindergarten in a speech therapy room.

Results

We diagnosed children according to the chosen scheme and obtained the following data reflected in the diagrams. Considering simple understanding and naming of words by a child, we see significant differences in the results of expressive and impressive speech. Pronounced delays in terms of expressive naming confirms the difficulty in choosing the right word with the necessary semantic meaning. Describing the results in quantitative terms, we see the presence of a low and below middle level, thus most children cope with the task within 25–50% (Figures 1, 2). The correct definition of words denoting adjectives and verbs caused the greatest difficulties.

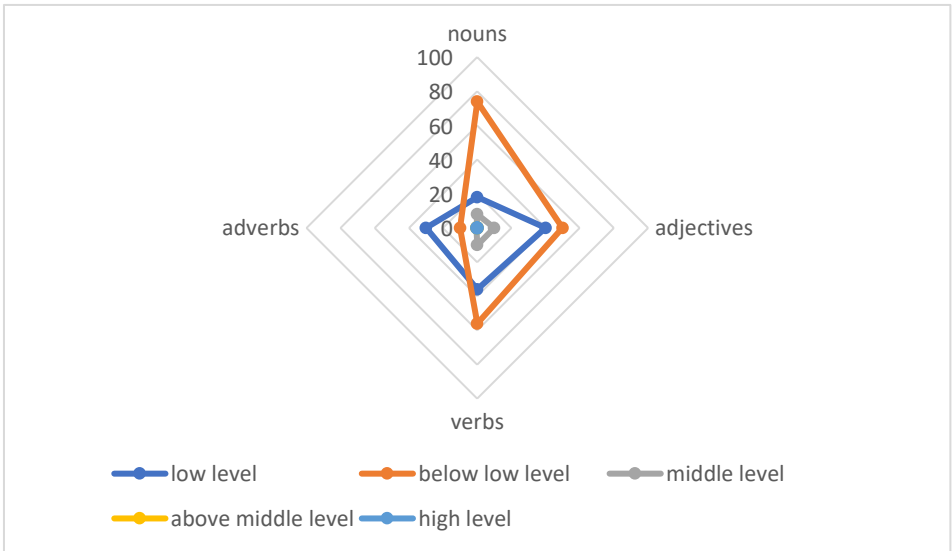

Figure 1. Passive vocabulary study

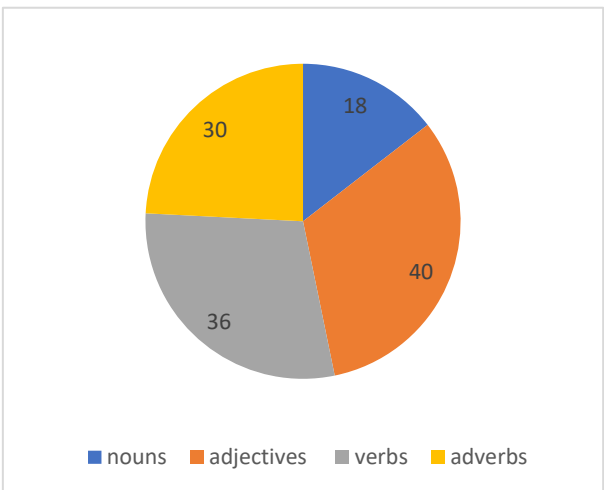

Figure 2. Passive vocabulary study (indicators of the maximum unformed skill)

The active vocabulary study revealed great difficulties in naming adverbs, adjectives and verbs. The majority of children (84–96%) experienced difficulties to name the right actions of objects, define the sign of the object. They made numerous mistakes while choosing words and performed the task within 25% (Figures 3, 4). This confirms that in the active vocabulary children with speech disorders minimize the usage of adverbs, adjectives, as well as the diversity of verbs, i.e. when children perceive objects and their actions, they probably form a limited semantic field which they can voice.

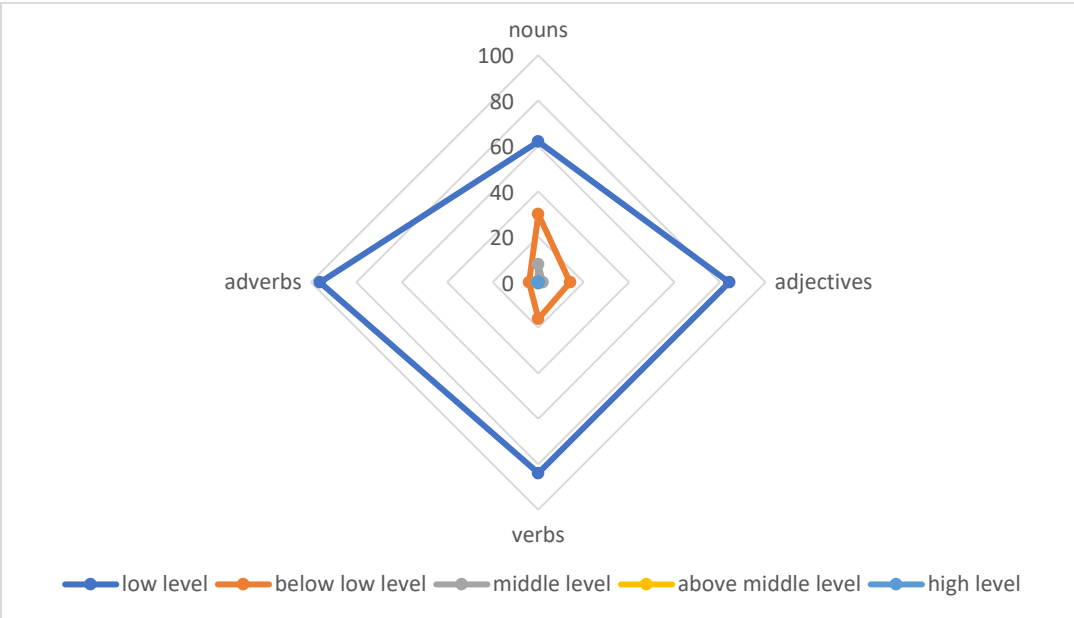

Figure 3. Active vocabulary study

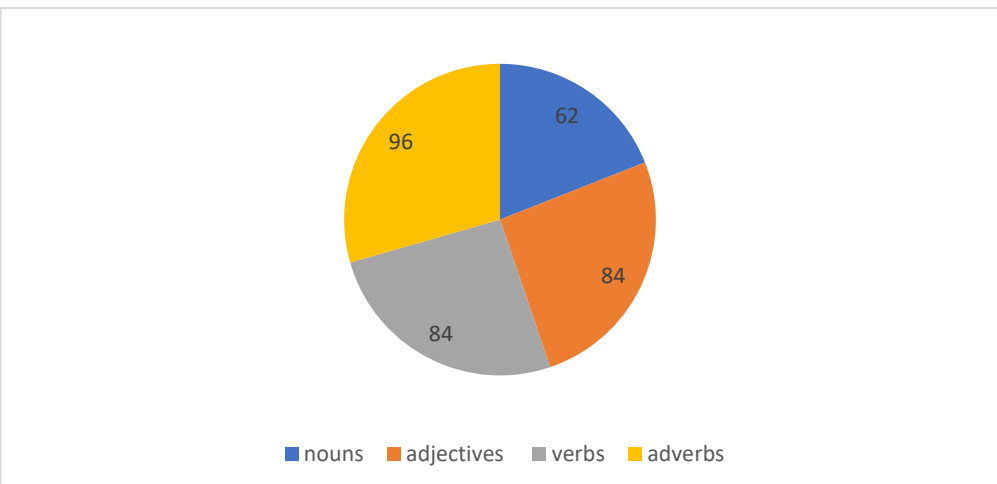

Figure 4. Active vocabulary study (indicators of the maximum unformed skill)

The study of the semantic structure of the word and lexical consistency in preschool children with impaired speech development (Figures 5, 6) takes a special place in our study. The study group does not perform tasks at a high level, the same is observed when we diagnose the passive and active vocabulary, but in this section of the diagnostics there is already a level above the average in 8% of children. These children are able to add the last word to the sentences, they find the correct word in their dictionary and can pronounce

it. At the average level, children give about 50% of correct answers to the task to add the last word to sentences and to classify and group. This indicates that children have intact intelligence and they can combine objects into classes, however they have difficulties in the correct naming of these groups and the rationale for their choice. Besides, this may influence the formation of the semantic field which contributes to productive verbal communication, and in case of identified difficulties, children will not be able to correctly express their thoughts to the interlocutor. 70–86% of children have a lower level, below the middle, when choosing synonyms, antonyms, adding one common word to others. This task causes difficulties, since the children do not perceive different signs of objects and phenomena. They do not orient themselves in the variety of objects' functions. They lack this experience, which is formed during the perception of objects, interaction of these objects with others, i.e. they do not form these relationships. As a result, the variability of the semantic field is not be formed, it is be limited to one or two options. The task to explain the meaning of words turned out to be the most difficult. 86% of the children in the experimental group could not cope with it. To explain the proposed words, the child needs both to remember the group this object belongs to and enumerate characteristic features, but studying the object in limited conditions and with a stereotypical, uniform image, the child does not form this diverse system of features and functions of the object (Figures 5, 6).

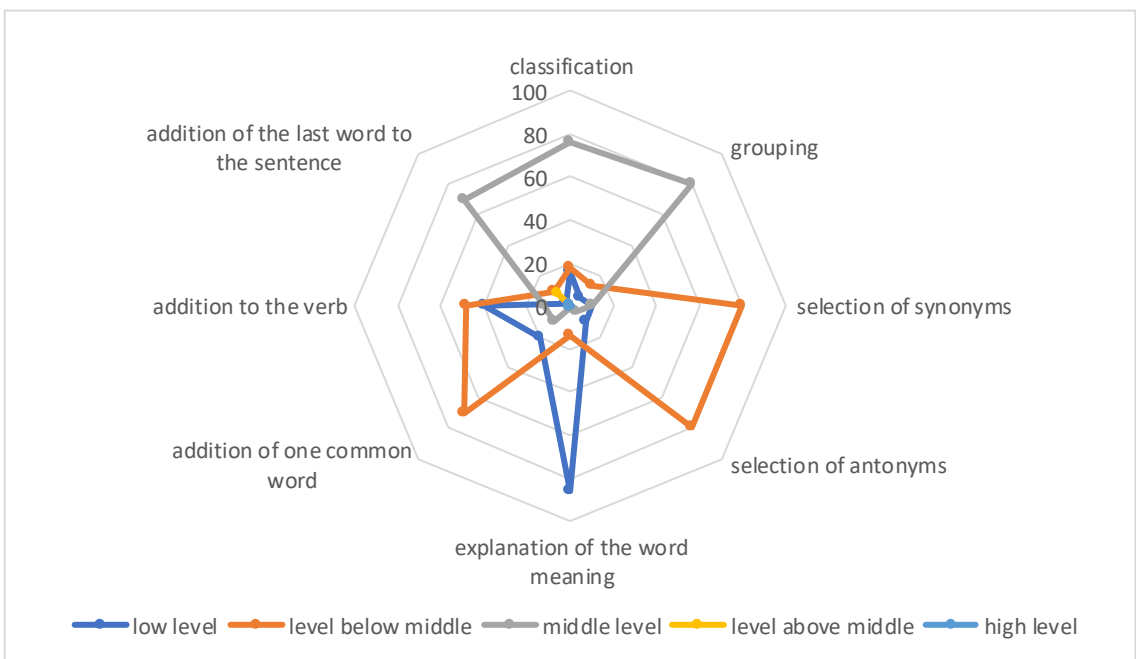

Figure 5. The study of the semantic structure of the word and lexical consistency

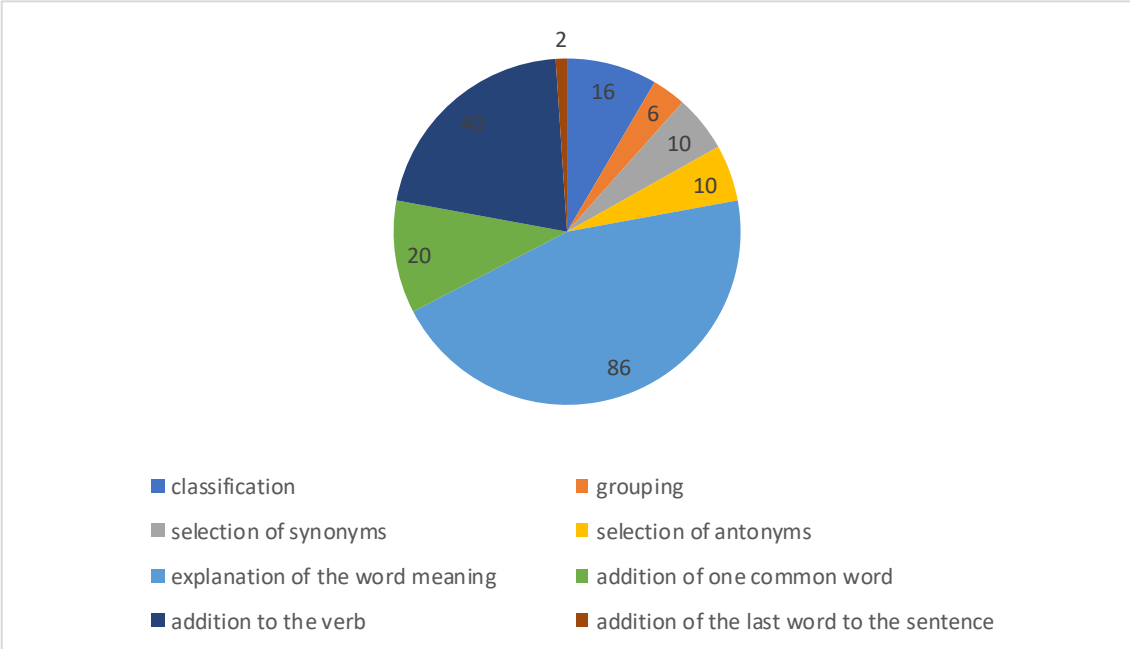

Figure 6. The study of the semantic structure of the word and lexical consistency (indicators of the maximum unformed skill)

It is important to determine the skill of word formation to specify the possibility of forming semantic fields of words (Figures 7, 8). A high level was not revealed. The children (8–16% of children) showed the above-middle level in the formation of adjectives, names of cubs, diminutive nouns, verbs with the meaning of the beginning/end of the action. The children's answers were counted as correct due to self-correction, since if they named the words incorrectly, they could correct them themselves and give the right answer. The participants completed tasks on the formation of adjectives and names of cubs correctly (80% and 60%, respectively) only after stimulating assistance; it refers to the middle level. The main group of children (70–84%) performed at a below middle level. They needed stimulating help. There were no more than 20% of correct answers, the rest of the answers were incorrect as the form of the word was incorrectly formed. These data are associated with responses to the tasks to form diminutive nouns, differentiate verbs formed with the help of prefixes, form words of female names for professions, differentiate perfective and imperfective verbs, form verbs with the meaning of the beginning/end of the action. The most difficult task for children with speech disorders was to form words according to the definitional type. 80% of the children completed this task at a low level, i.e. the task was not completed at all or children refused to complete it. The children could not cope with the replacement of a phrase with one word. They repeated either an action or an object, or a word similar to the correct answer, but it was a wrong word form.

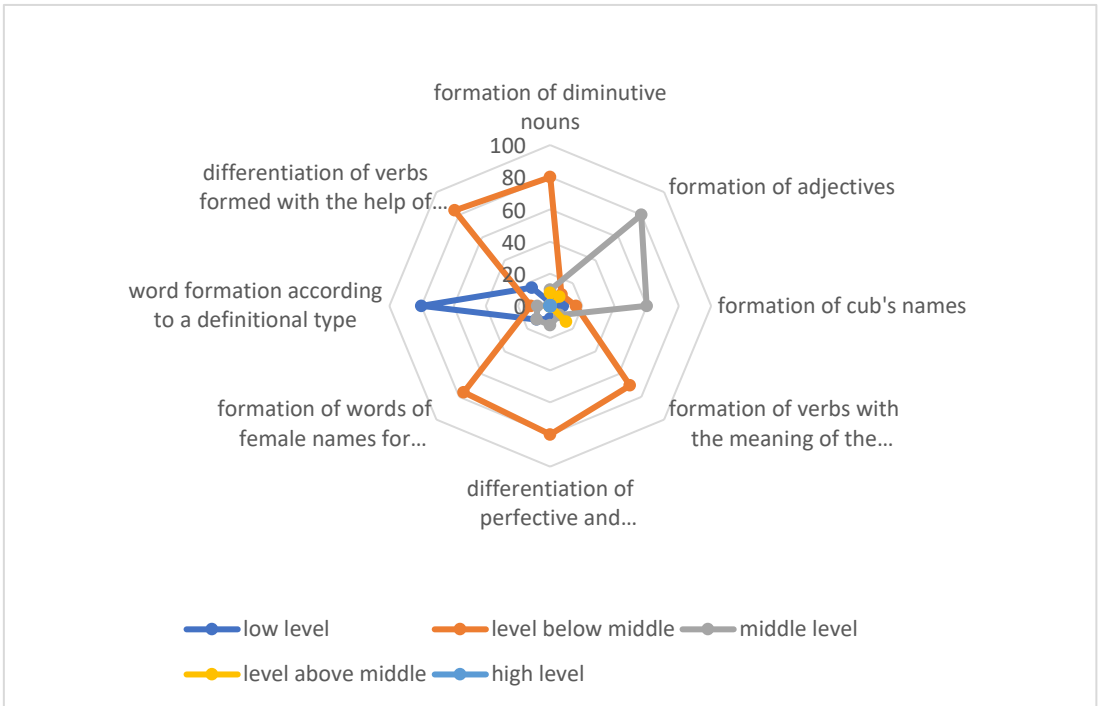

Figure 7. Word formation study

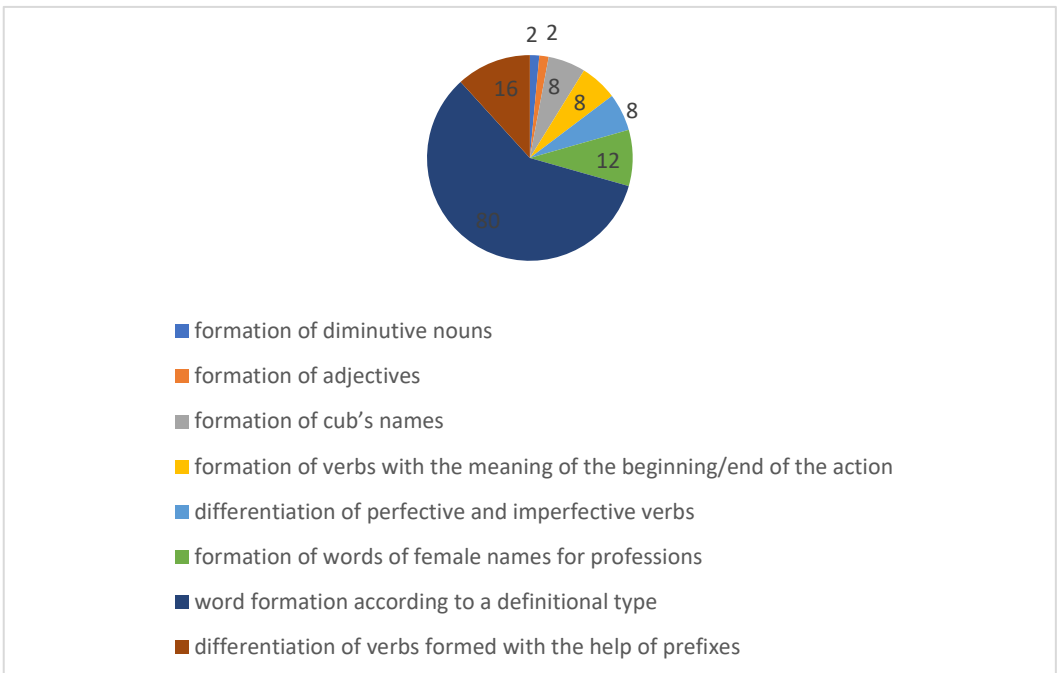

Figure 8. Word formation study (indicators of the maximum unformed skill)

The last diagnostic technique was aimed to study a sensory image of the word while performing the verbal association task (Figure 9). 14% of children performed this task at the level below middle. 86% of children with speech impairment showed a low level. If a delayed completion of the task is not considered as a difficulty, it was complicated for children to say the word that they associated with the named word. This happened due to various reasons: there was no associative connection, it was difficult to reproduce exactly the word that they wanted, it was difficult to choose the right word from the few words from their own experience. Therefore, the semantic field is not forming as there are no words that the child passes through themselves, through an individual emotional attitude to an object or phenomenon.

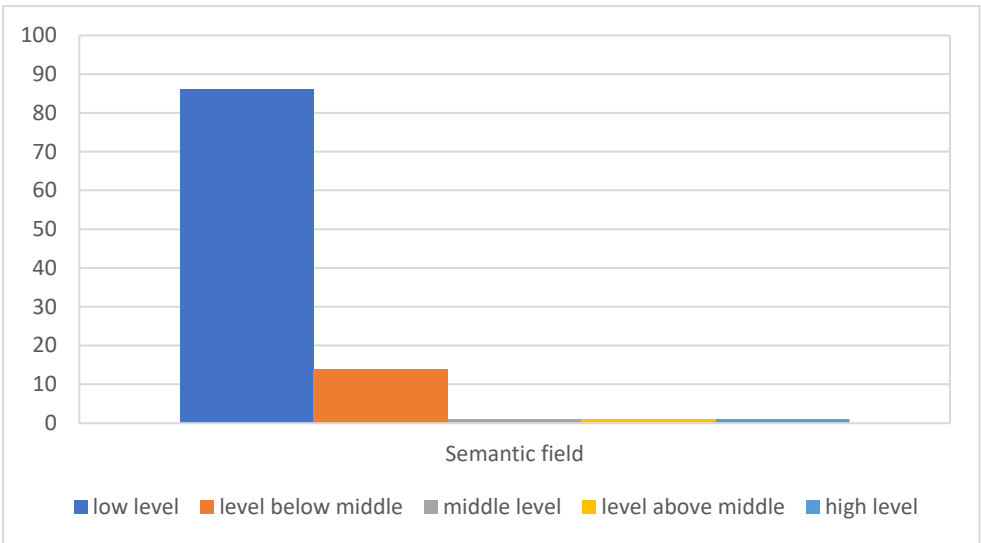

Figure 9. Sensory image of the word

We have used our diagnostic algorithm to analyze the results showing the level of the word sensory image formation and lexical-semantic aspects of speech, as well as the semantic field and have got an in-depth picture of the prerequisites to form semantic fields (Figure 10).

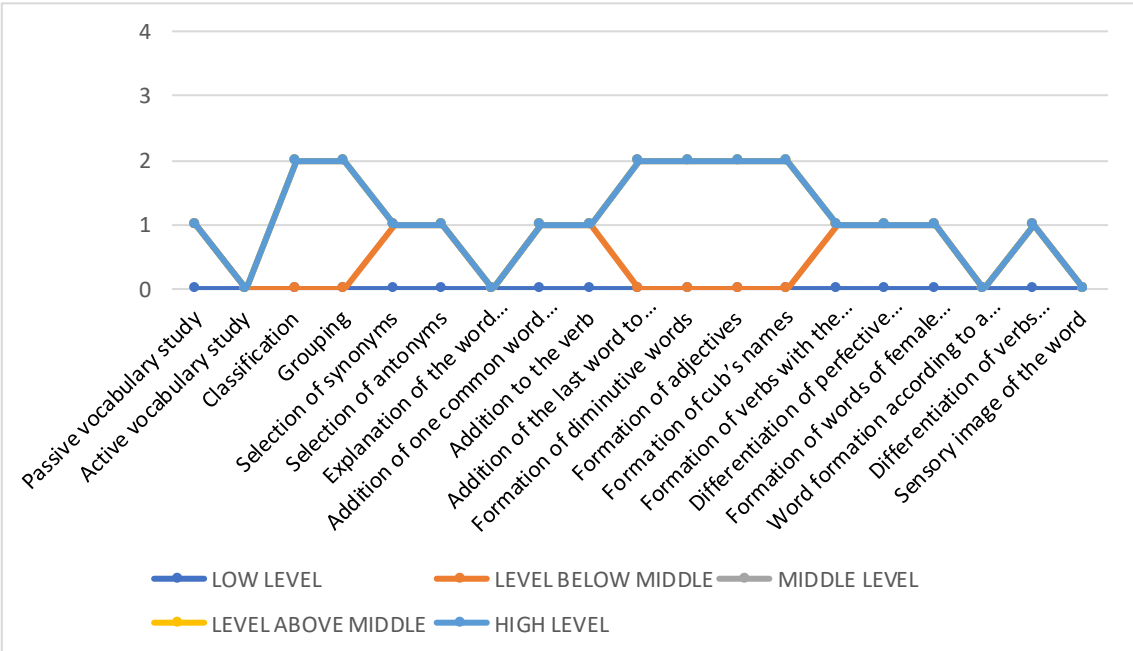

Figure 10. Profile of the level of the word sensory image and lexical-semantic side of speech formation

The growth points for the children of the experimental group include the active vocabulary formation, ability to explain the meaning of words, word formation according to the definitional type, formation of verbal associations (a sensory image of words).

Discussion

Speech in modern society is the main component for socialization, choice of professional activity, communication in all spheres of human life. A person develops clamps, negativism and other personality traits that affect communication if they experience limited opportunities for using speech. Our study allows us to find out what semantic structures are important to develop in a child for full-fledged communication. The elaborated diagnostic research algorithm is associated with the study of semantic fields and all speech components development; it provides a profound study of the speech semantics thus contributing to the development of coherent speech in children with speech pathology.

The experimental study has identified the following main difficulties in children with severe speech disorders: accumulation of active and passive vocabulary and the use of active vocabulary words. This is confirmed in the studies of Eremina (2014); the authors explain difficulties in the formation of active vocabulary by later terms of its formation in comparison with the passive one. When we analysed the semantic structure of the word and lexical system, it turned out that children experienced great difficulties to explain the meaning of words and to add words to a number of proposed words. These results correlate

with the study conducted by Shpekht and Kovrigina (2007); it is noted that children have numerous paraphasias (replacement of the correct words by others that do not match the context), which may refer to both the same and different semantic fields (Shpekht & Kovrigina, 2007). As a result, it is difficult for children to explain the meaning of a particular word. The description of objects relationships, understanding this relationship, arrangement of the correct word order, semantically and grammatically correct construction of a sentence – statement caused considerable trouble in children. The word-formation skill was also poor, children had difficulty using variable word patterns, they did not feel grammatical changes at the level of a phrase and sentence. Sensory images of words were underdeveloped to a greater extent; children showed difficulty in forming associative links between words; they, despite a sufficient level of thinking, used words in specific situations and could not easily replace them by synonyms or antonyms. Eremina (2014) describes in her work that when performing assignments for associations, children use the name of only specific objects; inadequate responses are also recorded. In our study we identified pathogenic mechanisms and determined the features of delay in the formation of semantic fields in children with severe speech disorders. Pascoe et al. (2006) also studied the causes of impaired oral vocabulary and speech intelligibility, but unlike our study, this group of authors looked for relationships between developmental language disorder (DLD) and speech sound disorder (SSD).

We believe that these results are of great importance for the development of a correctional work model aimed to form the semantic side of speech in preschool children with severe speech disorders as they take into account all aspects of the semantic side in connection with grammatical, phonemic and lexical systems.

Conclusion

The analysis on semantic structures will help specialists understand the pathogenic mechanisms for forming the semantic aspect of the speech and semantic fields. An integrated approach is required to study the semantic field. The semantic field has a heterogeneous system, implicitly located in the text content.

The elaborated diagnostic research algorithm of semantic fields formation allows speech therapists, speech pathologists, educators and teachers to correctly analyze the characteristics of children's speech and carry out a high-quality correctional work to develop coherent speech and its semantic components in preschool children with special needs. An integrated approach to diagnostics reveals the underlying mechanisms of violations in the formation of semantic fields and the potential of the child. This diagnostic algorithm identifies these semantic markers that are to be formed in the correctional process of children with a delay in the formation of semantic fields.

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