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Formation of Mastering Morphology Mechanisms and Word Formation in Children: Neuroscientific Research

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Abstract: *The article presents an analysis of the problem of mastering morphology and word formation in children in neuroscience, biology and linguistics, identifies motivational mechanisms that contribute to learning experience, namely: joyful, meaningful, active, motivational and social - in mastering morphology and word formation in children. From a neuroscientific point of view, these features can contribute to the acquisition of skills and contribute to the mastery of morphology and word formation in children.*
Models that describe the work of children's brains in mastering the morphological and lexical skills in them, expand the understanding of the probable mechanisms inherent in the human brain. In addition, studies of the cerebral cortex show that the brain of children is more vulnerable and sensitive to environmental influences, to the acquisition of knowledge than the brain of adults. With this in mind, the available scientific literature on the topic has been studied and (in most cases) the question of how each function can influence children's learning to master the basics of morphology and word formation has been studied. The importance of studying the research topic is due to the difficulties that arise in children when mastering morphology and word formation at different ages.

Keywords: *Motivational mechanisms; brain work; neuropsychology; interdisciplinary approach; integration of knowledge.*

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Introduction

Nowadays, there is a need to interconnect knowledge about the peculiarities of teaching morphological and lexical bases in children with neurological, neurophysiological, neuroanatomical, neurochemical, neuropsychological, neuropsycholinguistic sciences.

The multidisciplinary experience gained in each of these sciences has long gone beyond interdisciplinarity in practice, due to the interaction of traditional methods of language learning with modern technologies of neurological correction, a systematic approach to organizing and providing neurological care features in mastering morphological and word-forming skills in children.

Today it is important to recognize that the problems of brain stimulation of certain anatomical structures of the brain in children need regulation (or) mental development. During this time, multidisciplinary research is being actively developed in Ukraine (Demchenko et al., 2021; Kosholap et al., 2021; Prots et al., 2021). The need to study this perspective of the research topic is due to the difficulties that arise in children in mastering morphology and word formation at different ages.

Neuroscientific research on methods and techniques that contribute to the acquisition of knowledge of morphology and word formation in children are presented in the works of domestic and international scientists thematically:

- ontogenesis and neurontogenesis of language development – (Walsh, 1992);
- neurocognitive ontogenesis of development - in the works of A. Paliy (2010);
- neurogenetic diagnostics – (Ainscow et al., 2006);
- neuropsycholinguistic diagnostics and correction – (Lalaeva & Serebryakova, 2004);
- neuroorthopedic diagnosis and correction of children with the consequences of cerebral palsy – (Konoplyasta & Sak, 2010).

Scientific works, explaining the problem of ontogenesis and neurontogenesis of language development, give an analysis of neurocognitive ontogenesis of development, acquaint with neurogenetic and neuropsycholinguistic, neuroorthopedic diagnostics and correction, help to choose the perspective of learning to master knowledge of child morphology and word.

Reaction to newly formed stimulus in the brain during mastering morphology and word formation in children: neuroscientific research

With the advent of modern methods of neuroscientific processes of the brain, the range of scientific interests of domestic and foreign scientists has expanded significantly. Advances in neuroscience have made it possible to analyze the mechanisms of mastering morphology and word formation in children.

Due to the integration of the achievements of neuroscience, medicine, speech therapy theory and practice of correction of severe and complex speech disorders, technologies of neurostimulation of speech zones are actively used to master morphology and word formation in children. The word is related to the ability of neurons to receive, process and respond to various signals received by the senses or otherwise, both at the basic and more complex stages. Such diverse manifestations often serve as useful factors (if not the basis) for the proper development of mastery of morphology and word formation in children (Cook & Friend, 1996).

The acquisition of morphology and word formation in children begins through direct interaction with educators, teachers or parents, as the child receives visual, auditory, linguistic and social and emotional information at an early stage to obtain information and knowledge about morphology and word formation (Zalevskaya, 1998).

It promotes language development, cognitive control and emotion regulation as we grow older (Fahey & Forman, 2012). The joy of forming new vocabulary, introducing it into your vocabulary, learning new vocabulary of different parts of speech, the ability to use them in the right context is associated with the presence of elevated levels of dopamine in the child's brain, which promotes better memory, attention, cognitive flexibility, creativity (Paliy, 2010; Wilson, 2012). Establishing connections between known lexical elements and unfamiliar words is a stimulus that stimulates the brain in learning, which requires considerable effort. With considerable experience, new stimuli emerge that consist in the absorption of learning words or word forms that are related to existing mental structures. The reaction to such newly formed stimuli in the brain is associated with analogous thinking about the formation of new forms of word formation or the use of words of a particular language in a particular context, memorization, understanding of personal mental functions (metacognition), motivation, reward system (Lodatko, 2011).

Involvement of all processes, improves the processes of memorization, forms a lexical vocabulary in children. Through the active participation of various morphological word formations in the brain, connections are involved that are responsible for control skills, such as neutralizing distractions that promote short-term and long-term learning, a reward system and neural networks responsible for memory that promotes learning (Gardner, 2006).

In combination with exercise, motivational activity usually uses neural networks for similar actions and decisions, flexibility of thinking and creativity (Leontiev, 1996).

Established positive contact between the educator and the child helps to form neural connections for the development of healthy social and emotional control and protection from any obstacles to learning, from stress. Social positive interaction in childhood contributes to the plasticity of processes in the brain, which later helps to cope with life's problems. Such interactions activate the connections in the brain related to determining the psychological state of other people, which can be a very important factor in the interaction in the process of acquiring knowledge (Figueroa-Sanchez, 2008).

Here are five signs of learning when children learn word-formation states and the basics of morphology - meaningful, social, active, motivating and joyful, which contribute to a variety of information consumption and thus stimulate neural networks responsible for learning so that children begin to master lexical-grammatical, word-formation and morphological level.

Learning the basics of word formation is done by expanding the child's vocabulary. Acquiring word formation skills is a long process, it occurs mostly during school, but in this process a special place is occupied by the initial phase of learning (Hemsley-Brown & Sharp, 2004).

V. Lubovsky (2013) noted that mastering word formation is preceded by mastering the logical structures and operations of the child. Therefore, the teaching of children's language, which explores the processes of word formation, at the initial stage should be based on the practical mastery of this material. E. Zhinkin (1969) proposes to use neural networks responsible for learning in the following perspective: comparison of words and their word forms, selection of sound complexes (morphemes) that have this meaning, their systematization and generalization, formation on this basis by analogy of words and word forms.

In the current state of development of the science of word formation, it is considered as a special activity of linguistic thinking, which has a number of basic operations: the operation of selection and recognition of morphemes when listening to the sound of words and operation - integration of a new (derived) word. Assimilation of the morphological system of word formation involves mastering a number of actions and operations of the child with language signs (in this case with morphemes), the means used for them; it is the main means of enriching the vocabulary of the native language, ie the creation of new words. The subject of word formation is the formation of new words based on morphemes, design principles, word formation models (Dail, 2011).

The level of word formation lies between the morphological and lexical-semantic basic level. The essence of the relationship between the levels is that the basic unit of the morphological level - the morpheme - is used to generate units of the lexical-semantic level - words (tokens).

A morpheme is a minimally significant indivisible part that is characterized by its structure by comparing a word with other words with the same morphemes (Greenspoon & Seliverstov, 1988).

One of the characteristics of a morpheme is its recurrence (affix morphemes); the root can also be solitary.

Root morphemes are the lexical core of the word, function as an organizing structural-semantic center, around which are strictly located affixes of the word with additional meanings (prefix and suffix - new lexical and emotional shades, the ending serves to combine words into one sentence and has grammatical meaning).

The process of word formation in children, aimed at repetition and memorization, use of words - unproductive; the child must know its mechanism and learn to use it. The essence of the model of this education is a materialized demonstration of the word-forming system of language as the most general rules of construction and use of creative units for children. Children pay attention to how words are formed with the help of suffixes or prefixes, as well as develop word formation skills (Mystkowska, 1972).

Methods of teaching word formation to preschool children were used by such scientists and practitioners as B. Greenspoon, and V. Seliverstov (1988) with the help of the same morphemes in different words to denote similar phenomena.

Mechanisms of mastering morphology and word formation in children

There are such mechanisms for learning word formation in children (Lubovsky, 2013)

- Formation of skills of practical use of words with different morphemes.

- Formation of the ability to determine common word-forming affixes in words with different lexical meanings.

- Formation of skills of practical use of words with different morphemes.

When forming the grammatical system of word formation it is necessary to take into account the following algorithm (Irvine et al., 2010):

1) Formation of words with a certain meaning with the help of diminutive suffixes or with the same word-forming affixes (depending on the meaning and sound of -ichk (a));

2) the choice of a common morpheme;

3) determining the meaning of the affix;

4) analysis of sound compositions' morphemes (for older children);

5) independent word formation with this affix.

The method of comparison is widespread in word formation.

The comparison is made on two levels:

- comparison of several words with the same word-forming affix: it turns out that these words have a common meaning and sound (ball, nose, dog, bow, etc.).

- comparison of related words (motivational and derivative): determines how similar and different these words are (forest - forest - forester - forester).

When choosing the lexical material for working out the grammatical system of word formation, the structural complexity of words and phrases is taken into account, ie the ability of children to pronounce sounds and reproduce words (Kovshikov, 2007).

The class system for children to learn the grammatical system of word formation should be a cycle (series) of exercises with gradual practice and gradual complication of the child's actions with the same language material, and then repeat this cycle at the end.

Word formation as an independent discipline has gone through several stages of formation. It was first considered and incorporated into morphology as a series of morpheme combinations, then this theory was

replaced by a structural-semantic approach that focused on derived word formation, defining a "derived base", focusing on creating the structure and semantics of each word (Ainscow et al., 2006).

At the present stage of linguistics in the study of word formation with children, three directions are proposed (Lalaeva & Serebryakova, 2004):

1. Syntactically (transformational). This approach was initiated by Chomsky. According to this theory, the semantics and structure of derivatives in linguistics are considered as the result of different syntactic constructions, and the concept of word formation rules is associated with the reproduction of the transition chain, which leads to the transformation of the original syntactic constructions and is based accordingly.

2. Onomasiological theory is based on the principle of nomination, that is the word-forming meaning is included in the nominative act as part of the mental content prepared for definition. It is not the formal expression of the word-forming component (prefix, suffix) that comes to the fore, but its nominative meaning, the ability to become the initial meaning of the word (you know - you know and you - motivates the names of parts) also in the linguistic form of functional semantics (formal-semantic). achievements of the two previous approaches. This approach to word formation is traditional.

The term "word formation" is usually interpreted in two ways (Forlin et al., 2010):

- section of linguistics that studies the creation, motivational new words on the basis of existing in the dictionary derived words; is the study of the structure of derived words, means and methods of their formation.

- is the process (or result) of forming new words on the basis of one-syllable words or phrases according to certain patterns that exist in the language. According to the methods used to obtain the derived value (Goodman, 1992).

It is an innovative process that sharply distinguishes word formation from the concept of "word modification", which is based on the creation of grammatical forms. In word formation, the relations between words are formal-semantic (both changes in "form" and changes in the individual meaning of vocabulary are easily recognizable). This distinguishes word formation from vocabulary, where the connection between words is primarily semantic (physical forms of words usually do not attract the speaker's attention) and from morphology, where formal connections

predominate (the semantics of grammatical categories are usually not controlled).

Mastering the system of morphological word formation begins at the age of two. And by the age of four children (except for atypical cases) fully master the morphological system of the native language. So in the language of a child with normal ontogenesis at 1 year 9 months - 2 years, the first derived words appear (mostly with the suffixes of diminutiveness and tenderness together with the first forms of numbers in nouns in the nominative and accusative) (Kirk & Gallagher, 1989).

If before this period the vocabulary arose only due to the child's assimilation of collective words, which are perceived from the language of adults, then his own word formation is especially common after two years. At the age of 2 years 6 months – 3years 5 months - 4 years derived words that are not in the language norms (children's neologisms), ie "language units or modified units of adult language", created by children begin to appear intensively.)

This is explained not only by the child's cognitive activity, but also by his focus on significant morphological elements of language and how he works on pointing to new phenomena in the surrounding reality. Mastering the morphological nature of word formation leads to an increase in the vocabulary of children from 2 to 5 years, also due to the appearance of words formed by the child, as mentioned above.

Thus, according to A. Zalevska (1998), in the structure of all children's neologisms there is a characteristic form in which the original, which cannot be found in ordinary language, is a combination of morpheme elements. When forming a new word, the child takes into account only the basic meaning of its root and affix part, but not more subtle patterns of phonological or semantic compatibility of word-forming morphemes.

Gradually, the child begins to notice that his neologisms do not meet the norms of the native language, which the child constantly hears in the language of the adults around him. Therefore, later these neologisms are replaced in the child's language by words that correspond to the standardized vocabulary of the language. As a result, up to four years, the system of morphological word formation is almost completely mastered, except for rare and atypical forms (Neumann & Neumann, 2012).

This significant experience of developing mechanisms for mastering morphology and word formation in children can be useful through the inclusion of neural networks, we understand why we learn. It is believed that the study of new material includes the following two types of neural

structures of the brain: the system of rapid learning and the system of further learning (Lubovsky, 2013).

The first type of neural network in the formation of mechanisms for mastering morphology and word formation in children allows you to quickly and purposefully acquire knowledge, contradictions or potential threats.

The second network, in developing mechanisms for mastering morphology and word formation in children, helps to incorporate new information into existing mental models to establish a link between unknown and already known information based on higher cognitive processes. The best functional relationships between the two networks help to link external stimuli to existing cognitive models that find learning useful, and knowledge gained in one area can be transferred to new, real-world settings.

There are many scientific studies that support the neural connection of various aspects of learning that relate to the five identified characteristics of learning through play. This allows us to better explain how the gaming experience can contribute to the learning process. We found that the mechanisms described in the relevant literature show a generally positive cycle. In other words, each symptom is related to neural networks that are associated with certain processes in the brain, including the reward system, memory, cognitive flexibility, and stress control activated during learning. Activation of such neural connections, in turn, helps to prepare the child's brain for further development (Kirk, & Gallagher, 1989).

Conclusions

Thus, a sense of joy helps children determine the importance of what they do or learn, while actively engaging, motivating, and social components can teach children the basics of lifelong learning.

So far, our understanding of the neural aspects that contribute to learning has been confirmed. The joy of forming new words, learning new vocabulary of different parts of speech, the ability to use them in the right context is associated with increased levels of dopamine in the brain, which is responsible for better memory, attention, cognitive flexibility, creativity. Establishing connections between known lexical elements and unfamiliar words is a stimulus that stimulates the brain in learning, which requires considerable effort. The process of word formation in children, aimed at repetition and memorization, use of words - unproductive; the child must know its mechanism and learn to use it. The essence of the model of this

education is a materialized demonstration of the language word-forming system as the most general rules of construction and use of creative units for children. Children pay attention to how words are formed with suffixes or prefixes, as well as develop word formation skills.

The classification system for children to learn the grammatical system of word formation should be a cycle (series) of exercises with gradual practice and gradual complication of the child's actions with the same language material, and then repeat this cycle at the end.

This determines the environment and conditions for students that promote learning and for whom such conditions are most effective. Such a more detailed understanding can help us plan neuroscience, thereby further explaining the relevant neural mechanisms that can facilitate learning the basics of word formation and morphology. The links between play and learning, as well as the links between different characteristics of play, learning, also open up opportunities for further research.

For example, we may find that joy is associated with a reward system that encourages creative and flexible thinking; on the other hand, it is quite possible that it is the ability to show creative and flexible thinking that inspires joy in learning.

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