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**COGNITIVE DEVELOPMENT OF PRE-SCHOOL
CHILDREN WITH LANGUAGE AND SPEECH DISORDERS**

Abstract. The modern educational situation in Kazakhstan shows that the number of children with developmental problems, including speech disorders in primary school is increasing. Therefore, primary education is beginning to pay more attention to the problem of training and adaptation of the senior preschool children with speech disorders. The success of these educational institutions would be unthinkable without qualified comprehensive assistance of children with speech disorders. The growing importance of the development of special teaching systems takes into account the psychological characteristics of children with speech disorders at the preschool age. The knowledge of cognitive development of preschool children with speech disorders will provide a theoretical basis for the creation of more effective corrective speech therapy programs. These take into account the complex interactions of the higher mental functions of the child in the ontogeny which can contribute in overcoming the difficulties of preschool speech and the formation of a fully-fledged readiness for school. Language is the expression of human communication through which ideas, information, emotions, and beliefs can be shared. Typically developing children master the fundamentals of language and speech in the toddler-preschool era. Language and speech skills serve a pivotal role in learning and social relationships. Delays in the early development of language and speech skills, which are prevalent in the population, may affect several domains of function. The purpose of the study is to identify the characteristics of cognitive development of senior preschool children with phonetic-phonemic and general underdevelopment of speech. The factor analysis revealed that senior preschool children with speech disorders are characterized by cognitive development and intellectual readiness for school that consists of two factors: understanding of the quantitative and qualitative relationships as an essential component of intellectual readiness for school; general awareness, vocabulary.

Keywords: cognitive development, speech disorder, preschool children.

1. Introduction

Developing age-appropriate educational programs to support children's intellectual development resulting from the reorganization of preschool education system is fraught with problems. In order to solve these problems it is necessary to know about the intellectual development of senior preschool children. It is also necessary to make an analysis of Child Psychology principles and current domestic and foreign psychological research of intellectual development of the child.

The Soviet Union school of psychology was based on same methodology which was influenced greatly by Bolshevik revolutions and Lenin's ideas:

1. Stages of cognitive development as a result of activity. (Leontyev, 1978; Ananyev, 2000; Vygotsky, 1978; Elkonin, 1972) [1-4]
2. Law of "interiorization" and "zone of proximal development" (Vygotsky, 2000; Elkonin, 1972) [5]
3. The variation of activities and learning strategies (Galperin, 1978; Davydov, 1992; Popov, 2002) [6-8]
4. The role of individual differences in intellectual development and training activities (Averin, 2000; Ushakova, 2015). [9,10]

Development can be described as a process of initiation and improvement of these internal means of activities, as the process of overcoming internal obstacles in the implementation of activities, as the process of expansion the borders of zones of actual and proximal development, as the process of assigning the ways of the joint activity by a child (interiorization), as simultaneous movement in different directions,

described by multi-vector model of the zone of proximal development, leading to the appearance of new vectors, to the quality changes of the state of vectors and the interrelationships between them (Vygotsky, 2000). [11]

Intellectual development is understood as a continuous dynamic process by most Soviet authors. Different authors identify various aspects of intellectual development, indicating the quantity and quality of its structure, indicating out features of mental activity (operations and mental actions), different forms of thought (Galperin, 1978; Davydov, 1992; Volkov&Volkova, 1998; Zhukova, Mast'yukova, Filicheva, 1998). [12, 13]

The Russian psychologists are guided by the principles of the system and structural-genetic approaches to the study of children's intellectual development (Garber, 2013) [14]. They do not oppose education and intellectual development, general and special abilities, biological and social conditions of intellectual development (Kolomna and Panko, 1997) [15].

Social interactions define the mechanism of distribution of functions on the one hand and the means or method of mastering those functions on the other hand (Vygotskiy, 1987; Vygotskiy, 1988). Thus, for example, guided social interactions, which initially serve as instruments for social realization of the processes of cognition and communication later, begin to play the role of the cognitive function of self-regulation and mental representation of various kinds of information. These social interactions activate the not yet developed cognitive functions, which allow the child to act on a higher cognitive level. The gap between that which a learner is able to do on his/her own (the actual level of development) and that which he/she is capable of with proper guidance is called "zone of proximal development". Therewith, according to Vygotsky (Cole, 1996; Daniels, 2008; Daniels, 2010), learning is successful only when it goes ahead of development, when it awakens and brings to life those functions, which are yet in the process of maturing or are in the zone of proximal development. This, in his view, is the way how education plays a crucial role in development [16-18].

Currently, it revealed that children's intellectual development depends on brain structures and specially organized challenging activities. Education is a leading factor in the intellectual development of children. There are also some basic directions in the study of children's intellectual development in Western psychological school. One direction is characterized by examining the child's cognitive development as a result of the natural maturation of the nervous system and the whole organism (Hall C., Gesell A. et al.). The other direction of research of child intellectual development process is related with social environment (Hedegaard, 2012; Sannino, 2015) [20-22].

2. Problem Statement

There are two opposite tendencies in the scientific interpretation of concepts and structures of intelligence. The first comes from an understanding of intelligence as a single overall child-learning ability (Jensen, 1994) [23]; the second is based on an understanding of intelligence as a combination of many individual, relatively independent abilities (Guilford, 1982; Cattell, 1987) [24.25].

Further development of ideas about the nature of intelligence in foreign psychology was associated with justification. On the one hand, it is integrity of intelligence, on the other hand the multiplicity of its manifestations. Thus, Cattell (1987) identified two sides of intellect: one of them is due to the peculiarities of the structure and functioning of the brain (the main function is fast and accurate processing of current information) the other one the influence of the environment (the main function is the accumulation and organization of knowledge and skills).

According to Piage (1974), intelligence development occurs during the practice of a child with a variety of items. External material actions of the child are initially transferred into the internal plan through repetition in different situations, actions and schematized using symbolic tools (simulation, game, speech, and others) [26].

According to Wadsworth (1996) Piaget's theory determines the balance as a stable state of an open system. From the dynamic point of view balance is characterized by the mechanism that provides the basic function of mental activity [27].

The process of intellect developing consists of three large periods during which there is the emergence and formation of three major intellectual structures: sensor motor (system of reversible practical action), structures specific operations (system operations performed in the mind, but with

reliance on external visual data) structures of formal operations (formal logic, hypothetical-deductive reasoning and inference). Syncretism is one of the basic concepts of Piaget (1974), which is included in Child Psychology. He believed this phenomenon was one of the most characteristic features of the child's psyche, saying that until 7-8 years syncretism permeates their thought as a purely verbal, and aimed at direct observation. Piaget (1974) also described the interrelated forms or manifestations of children's undifferentiated physical and mental judgments. One of these shapes he called realism.

According to the cultural-historical theory of Vygotsky (1987), the specificity of a child's development relates to a social and historical basis. The main mechanism of a child's intellectual development is associated with the formation in their mind of verbal meanings (generalizations), the restructuring of which characterizes the direction of the growth of their intellectual capacities.

The main way of a child's concepts development depends on changes in the generalization of the word. Vygotsky (1978) believed that intellectual development is characterized by the level individual mental processes development and also by cross-functional relationships and their changes. Each period of intellectual development is inherent in the structure of certain mental processes. According to Vygotsky (2000) higher mental functions such as perception and memory intensively develop during preschool age.

Language is the expression of human communication through which ideas, information, emotions, and beliefs can be shared. Typically developing children master the fundamentals of language and speech in the toddler-preschool era. Language and speech skills serve a pivotal role in learning and social relationships. Delays in the early development of language and speech skills, which are prevalent in the population, may affect several domains of function (Ushakova, 2015; Alexandrov, 2013; Butusova, 2012).[28-30]

A speech disorder is when children have difficulty pronouncing the sounds in words. This can make their speech difficult to understand. Children with a speech disorder might have language skills that are otherwise good (Kozyreva, 2016).

That is, they understand words and sentences well and can form sentences correctly (Konovalenko, 2012). Speech and language disorders in children include a variety of conditions that disrupt children's ability to communicate. Severe speech and language disorders are particularly serious, preventing or impeding children's participation in family and community, school achievement, and eventual employment. Speech sound disorders is an umbrella term referring to any combination of difficulties with perception, motor production, and/or the phonological representation of speech sounds and speech segments (including phonotactic rules that govern syllable shape, structure, and stress, as well as prosody) that impact speech intelligibility (Nishcheva, 2014). [30-32]

Known causes of speech sound disorders include motor-based disorders (apraxia and dysarthria), structurally based disorders and conditions (e.g., cleft palate and other craniofacial anomalies), syndrome/condition-related disorders (e.g., Down syndrome and metabolic conditions, such as galactosemia), and sensory-based conditions (e.g., hearing impairment).

Speech sound disorders can impact the form of speech sounds or the function of speech sounds within a language. Disorders that impact the form of speech sounds are traditionally referred to as articulation disorders and are associated with structural (e.g., cleft palate) and motor-based difficulties (e.g., apraxia). Speech sound disorders that impact the way speech sounds (phonemes) function within a language are traditionally referred to as phonological disorders; they result from impairments in the phonological representation of speech sounds and speech segments—the system that generates and uses phonemes and phoneme rules and patterns within the context of spoken language. The process of perceiving and manipulating speech sounds is essential for developing these phonological representations (Khanin, 2012) [33].

Dysarthria is a speech sound disorder caused by medical conditions that impair the muscles or nerves that activate the oral mechanism (Caruso and Strand, 1999). Dysarthric speech may be difficult to understand as a result of speech movements that are weak, imprecise, or produced at abnormally slow or rapid rates (Morgan and Vogel, 2008). Neuromuscular conditions, including stroke, infections (e.g., polio, meningitis), cerebral palsy, and trauma, can cause dysarthria. Another rare speech sound disorder, childhood apraxia of speech, is caused by difficulty with planning and programming speech movements [34-38].

Children with this disorder may be delayed in learning the speech sounds expected for their age, or they may be physically capable of producing speech sounds but fail to produce the same sounds correctly when attempting to use them in words, phrases, or sentences (Reutskaya, 2013) [39].

Evidence suggests that speech sound disorders affect more boys than girls (Eadie et al., 2015), particularly in early life. In preschoolers, the ratio of affected boys to girls is 2 or 3:1, declining by age 6 to 1.2:1 (Pennington and Bishop, 2009). Although many children with speech sound disorders as preschoolers will progress into the normal range by the time of school entry, the close ties between spoken and written language have motivated many studies of the extent to which speech sound disorders are associated with an increased risk of reading, writing, or spelling disorders [40-43].

3. Research Questions

According to the structural and integrative approach intellectual development indicator is the level of differentiation of cognitive structures as carriers of intelligence.

Thus, the psychological and pedagogical sciences decided to allocate one of the main conditions for speech and intellectual development training. Language and communicative competence provide critical tools for learning, engaging in social relationships, and behavior and emotion regulation from infancy onward. Communication and normal psychological development in a preschool age depends on toddlers' opportunity to speak and verbalize their thoughts.

4. Purpose of the Study

The purpose of this study is to investigate cognitive development of preschool children with speech sound disorders. The hypothesis of the study is that the preschool children's cognitive development with a variety of speech disorders is characterized by certain specific features (in comparison with their peers with normal speech development).

5. Research Methods

Table 1 - Methods of research

General characteristics of methods	Structure of methods	Diagnosable indices
Method of rapid diagnosis of children's intellectual abilities at age of 6-7 years		
It gives indicative information about the ability to learn in primary school and an individual structure of child intelligence. It is an original design based on world-famous foreign intelligence tests.	I subtest	Total awareness, vocabulary
	II subtest	Understanding the qualitative and quantitative relationship
	III subtest	The level of logical thinking development
	IV subtest	Mathematical abilities
	an integral component of intellectual abilities	The overall level of intellectual abilities
Pictured Vocabulary Test		
The test is aimed at diagnosing the intellectual component of school maturity and to measure child verbal abilities. The test is a modified form of the famous American test "Phonic Key Card".		the level of higher mental functions development, including the orientation in outside world, awareness, vocabulary, visual perception, "the dictionary resourcefulness"
Screening test of school maturity		
The test is an adaptation of "Indicative test of school maturity" of Jirásek. It assesses the level of a child's general mental development and their school maturity	Non-verbal subtest comprises three tasks: 1. Drawing a male figure on the proposal; 2. Imitation of handwritten letter; 3. To copy a group of points.	Childs' psychomotor development, development of motor skills and hand motor coordination. The ability to reproduce pre-schooler writing letters and geometric shapes. It gives an indication of general level of child's intellectual development
	Verbal subtest contains twenty questions	The overall level of thinking, awareness about the world

5.1. Participants' characteristics

The research included 30 children from kindergartens in Samara, Russia. 15 participants of the experimental group were from children's speech therapy kindergarten groups with different speech and sound disorders. The other 15 healthy children from kindergartens were included as a control group of the study. The average age of participants is 5 years.

5.2. Statistics of research data

Experiment results were processed in SPSS 21.0 in order to define differences between experimental and control groups.

6. Findings

Statistical analysis of rapid diagnosis of children's intellectual abilities methods' results detected significant differences between the two groups using U-Mann-Whitney criteria. Firstly, it is the implementation of IV subtest, which aims to identify the mathematical abilities. The average (by groups) perform this subtest define that control groups' data almost three times higher than in the experimental group (2.1 points and 0.73 points, respectively). Secondly, it is a general indicator of the value of intellectual abilities. The average value of the control group is more than one and a half times the same in the experimental group.

Table 2 - Statistical analysis of children's intellectual abilities between two groups

	Subtest 1 "General awareness, vocabulary"	Subtest 2 Understanding the qualitative and quantitative relationship	Subtest 3 The level of logical thinking development	Subtest 4 Mathematical abilities	The overall level of intellectual abilities
	Method of rapid diagnosis of children's intellectual abilities age of 6-7 years				
	70,500	71,700	74,000	31,000	39,000
Mann-Whitney-U	,059	,062	,065	,001**	,001**
	Not significant	Not significant	Not significant	p<0,001	p<0,001

The results of current study show significant differences between control and experimental group in mathematical abilities and IQ level. The composition of the experimental group on the severity of speech disorders appeared heterogeneous: in the group included children with phonetic and phonemic speech underdevelopment and the general underdevelopment of speech. In connection with this analysis of intra-performance subtests of rapid diagnosis of children's intellectual abilities method in experimental group was conducted.

Table 3 - Statistical analysis of children's intellectual abilities between groups with two different speech disorders

	Subtest 1 "General awareness, vocabulary"	Subtest 2 Understanding the qualitative and quantitative relationship	Subtest 3 The level of logical thinking development	Subtest 4 Mathematical abilities	The overall level of intellectual abilities
	Method of rapid diagnosis of children's intellectual abilities age of 6-7 years				
	11,000	26,000	15,500	28,000	6,500
Mann-Whitney-U	,034	,782	,101	1,000	,009
	p<0,05	Not significant	Not significant	Not significant	p<0,01

Analysis of the data presented in Table 2 shows that there are several significant differences in subtests performance between participants of the experimental group with the sound speech disorders and

general underdevelopment of speech. The tests revealed significant differences in the performance of preschool children with speech sound disorders in first subtest ($p < 0,05$). Children with speech sound disorders perform better with subtests of general awareness and vocabulary than children with general underdevelopment of speech.

Table 4 - Statistical analysis of results of Pictured Vocabulary Test and Screening test of school maturity between experimental and control groups

	Pictured Vocabulary Test	Verbal subtest of Screening test of school maturity	Non-verbal subtest of Screening test of school maturity
	22,500	42,000	28,500
Mann-Whitney-U	,001**	,003**	,001**
	$p < 0,001$	$p < 0,01$	$p < 0,001$

Analysis of Pictured Vocabulary Tests' and Screening tests' data revealed significant differences between experimental and control groups. The results of the senior preschool children with normal speech development (control group) was significantly higher ($p < 0,001$) than the subjects of the experimental group (with speech disorders).

Table 5 - Differences between levels of different methods' performance by experimental and control groups

Levels	Low	Middle low	Middle	Above middle	High	Method
Experimental group	53%	47%	-	-	-	Method of rapid diagnosis of children's intellectual abilities age of 6-7 years
Control group	-	20%	67%	-	13%	
Experimental group	-	60%	40%	-	-	Pictured Vocabulary Test
Control group	-	13%	60%	20%	7%	
Experimental group	20%	53%	27%	-	-	Non-verbal subtest of Screening test of school maturity
Control group	-	40%	60%	-	-	
Experimental group	-	60%	40%	-	-	Verbal subtest of Screening test of school maturity
Control group	-	20%	53%	20%	7%	

Comparative analysis of the data presented in Table 5 has shown particular intellectual development of children with speech disorders. More than half of preschool children with speech disorders (53%) revealed a low level of intellectual abilities (based on the total index Method of rapid diagnosis of children's intellectual abilities aged 6-7 years).

The process of verbal designation as a transition from non-verbal to verbal content is carried out in the majority of preschool children with speech disorders below average. Backlog psychomotor (including hand-eye coordination) was detected in the majority of children with speech disorders (73%). Psychomotor development (including hand-eye coordination) is underdeveloped in the majority of children (73%) with speech disorders.

Overall, the number of preschool children with speech disorders was significantly lower than that of children with normal speech development (based on all the methods included in this study). There are differences in intellectual abilities in preschool children with various speech disorders. No significant differences were found between experimental and control groups in terms of detection of logical thinking "exclusion of excess".

Table 6 shows the factor loadings matrix. After rotation two new factors were found. They are shown in Table 6 were collectively explained 72.84% of the total variance, which is a good result.

Table 6 - Results of Varimax rotation

	Components	
	1	2
Subtest 1 "General awareness, vocabulary"	-,025	,927
Subtest 2 Understanding the qualitative and quantitative relationship	,841	-,099
Subtest 3 The level of logical thinking development	,762	,078
Subtest 4 Mathematical abilities	,432	,586
Pictured Vocabulary Test	,874	,343
Non-verbal subtest of Screening test of school maturity	,726	,419
Verbal subtest of Screening test of school maturity	,799	,429

The first factor is the most informative (48.61%). It is associated primarily with subtest "Understanding of quantitative and qualitative relations" and indicator of Pictured Vocabulary Test. This indicates that one of the most important components of intellectual readiness for school of children with speech disorders is their understanding of the quantitative and qualitative relationships, which may compensate their speech development.

Thus, the first factor described as an intelligent component is school readiness. The second factor is the information content (24.23%) that is determined by the first subtest "Total awareness, vocabulary." It should be noted that this figure is almost not related to other indicators in the second factor. Perhaps this is due to the peculiarities of children's speech development when intellectual and verbal readiness for school disharmony suffers in development.

7. Conclusion

Overall, there were conducted conclusions of this research:

1. There are some differences in the intellectual abilities of preschool children with various speech disorders: general awareness and vocabulary are better formed in children with phonetic and phonemic speech underdevelopment.
2. Intellectual abilities development of children with speech disorders is below the average level of their peers with normal speech.
3. The process of verbal designation as a transition from non-verbal to verbal content is lower in preschool children with speech disorders than in normally developing children.
4. Development of hand-eye coordination is decreased among children with speech disorders.
5. The factor analysis revealed that senior preschool children with speech disorders are characterized by cognitive development and intellectual readiness for school that consists of two factors: understanding of the quantitative and qualitative relationships as an essential component of intellectual readiness for school; general awareness, vocabulary.

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СӨЙЛЕУ ЖӘНЕ ТІЛ БҰЗЫЛЫСЫ БАР МЕКТЕП ЖАСЫНА ДЕЙІНГІ БАЛАЛАРДЫҢ КОГНИТИВТІК ДАМУЫ

Аннотация. Қазақстан Республикасының қазіргі заманғы білім беру жағдайы көрсетіп отырғандай, бастауыш мектептегі сөйлеу қабілетінің бұзылуын қоса алғанда, даму проблемалары бар балалардың саны артып келеді. Сондықтан бастауыш білім беру аясында сөйлеу тілінің бұзылысы бар мектеп жасына дейінгі балаларды оқыту мен бейімдеу мәселесіне көбірек назар аудару керек. Осы оқу орындарының жетістіктері сөйлеу бұзылыстары бар балалардың құзыретті және жан-жақты көмегінсіз мүмкін болмас еді. Осылайша, мектепке дейінгі жастағы сөйлеу бұзылыстары бар балалардың психологиялық ерекшеліктерін ескеретін арнайы білім беру жүйелерінің дамуының өзектілігі мен маңыздылығы өздігінен көрінеді. Мектеп жасына дейінгі сөйлеу бұзылыстары бар балалардың танымдық дамуын білу, тиімді терапия бағдарламаларын құрудың теориялық негізін қамтамасыз етеді. Тіл- адамдардың қарым-қатынас құралы, тіл арқылы идеялар, ақпарат, өздерінің эмоциялары және сенімдерімен бөлісуге болады. Тіл және сөйлеу дағдылары, оқыту мен әлеуметтік қатынастарда маңызды рөл атқарады. Сөйлеу көрсеткіштері мен тұлғалық сипаттамалары, олардың өзара әрекеттесуі баланың уақытылы және үйлесімді дамуына қамқор ересектердің назарында болуы керек. Бұл жалпы сөйлеу тілі дамымаған балаларға қатысты өте өзекті мәселе. Зерттеудің мақсаты – мектеп жасына дейінгі балалардың фонетикалық-фонемиялық және жалпы сөйлеу тілінің дамымауының когнитивтік даму ерекшеліктерін анықтау.

Тірек сөздер: когнитивтік даму, сөйлеудің бұзылуы, мектеп жасына дейінгі балалар.

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КОГНИТИВНОЕ РАЗВИТИЕ ДОШКОЛЬНИКОВ С РЕЧЕВЫМИ И ЯЗЫКОВЫМИ НАРУШЕНИЯМИ

Аннотация. Современная образовательная ситуация в РК показывает, что число детей с проблемами развития, включая нарушения речи в начальной школе, увеличивается. Поэтому, в рамках начального образования необходимо уделить больше внимания проблеме обучения и адаптации старших дошкольников с нарушениями речи. Успех этих учебных заведений был бы невозможен без компетентной и всесторонней помощи детям с нарушениями речи. Таким образом, появляется актуальность и важность развития специальных обучающих систем, принимающих во внимание психологические особенности детей с нарушениями речи в дошкольном возрасте. Знание когнитивного развития дошкольников с нарушениями речи обеспечит теоретическое обоснование для создания более эффективных корректирующих программ логопедии. Язык - способ человеческого общения, посредством которого могут быть разделены идеи, информация, эмоции и верования. Язык и речевые навыки выполняют основную роль в изучении и общественных отношениях. Показатели речи и свойства личности, их взаимовлияние должны быть в центре внимания взрослых, заботящихся о своевременном и гармоничном развитии ребенка. Особенно остро этот вопрос стоит применительно к детям с общим недоразвитием речи. Цель исследования состоит в том, чтобы определить особенности когнитивного развития старших дошкольников с фонетико-фонематическим и общим недоразвитием речи.

Ключевые слова: когнитивное развитие, нарушение речи, дошкольники.