

**3d International Scientific-Practical Conference  
on the Humanities and the Natural Science 2015**

## **PSYCHOLOGY**

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### **SCHOOL-AGE CHILDREN'S COGNITIVE DEVELOPMENT OF NORMAL AND IMPAIRED INTELLECTUAL GENESIS**

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#### **Abstract**

The article considers the concept of cognitive development, mechanisms and regularities of schoolchildren's intellectual development in totality (cognitive and intellectual, motor cognitive, personality development) as well as in the light of individual genesis.

**Purpose:** to show the cognitive schoolchildren development of normal and impaired intellectual genesis.

**Object:** school-age children cognitive development of normal and impaired intellectual genesis

**Subject:** age dynamics of cognitive development of schoolchildren with normal and abnormal intellectual functioning.

**Goals:** to research the cognitive processes of schoolchildren with normal and abnormal cognitive functioning in the light of gender differentiation; to study the components' interaction as the set of conditions of cognitive development of normal and impaired intellectual genesis in the light of gender differentiations; to define interdependence of the cognitive- intellectual, cognitive motor schoolchildren development of normal and impaired intellectual genesis. Author comes to conclusion that there are some general and specific regularities in cognitive schoolchildren development of normal and impaired intellectual genesis. There are gender, age, individual differences and relationships as in children's groups of the same age and age dynamics as well as in individual development.

**Keywords:** cognitive development, normal and impaired

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intellectual genesis, interrelations of cognitive components, analyses of differences.

It is presumed that intellectual activities as human mentality is the product of durable social and historical human development and has got its complex structure and relationship with brain. The author highlights the globality of the problem of human cognitive development, where the basic question is abilities' determination, their individual and psychological features that differ one person from another; individual features that stipulate the effectiveness of human activities as well as abilities that does not boil down to the skills, abilities, knowledge but are able to discover effective mechanism of their gaining.

Summarizing in retrospective cut the represented in literature scientists' investigations we can highlight some approaches to the problem: age approach, individual differences, personal approach as the primary determinant of understanding the concept of abilities.

The background of the survey has become the study of children's cognitive development of normal and impaired intellectual genesis.

In the case of brain structure disabilities at natal, perinatal, and postnatal periods, disrupt the learning and intellectual development but "brain possesses significant compensatory capacities that must be taken into account for research the development, correction, training and education of children with intellectual abnormal functioning and development problems" [2].

The author assumes that human cognitive development implies special structure, with components that interact and can be filled individually such as cognitive intellectual, cognitive motor and cognitive personal structures, not eliminating the adaptive individual value in each of them.

The term "cognitive- intellectual" is used in its integrity and includes the cognitive component, regarded as an organization form of individual mental experience in represented mental structures, generated by its mental reflection in the limits of the mental representations of reality. Also it implies the intellectual component in relation to mental mechanisms of information processing in different levels of cognitive reflection (M.A. Khododnaya. 2002), not excluding the cognitive occupancy rate in personality features [6].

A.N. Leontyev had identified interrelation of the motor skills development level and mental development, emphasizing that mentality does not reveal itself in motor processes but it in its turn forms the human mentality.

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Taking into consideration of A.N. Bernstein's conception that movements as objective actions are the semantic acts, in other words they are not so much as motor acts (movements) but soon elementary acts, conditioned by assigned task, we can see the cognitive component in meaningful acts. Any of targeted motor acts is always arranged consciously and realizes and corrects corresponding to its goal relevance and consideration of motor human capabilities. The unity of the goal, semantic and motor components are the psychomotor structure of action, and represents as mechanism of goal achievements (M.O.Gurevich, N.I. Ozeretskiy,1930).

We define the development as regular and quality change that characterizes as irreversible and aimed, directly implemented through cognitive, motor, personal activities [B.F.Lomov, 1984, V.P.Ozerov,1986, M.V. Bodunov,1980,A.I. Krupnov, 1983 and others]. So, exceptional property of human consciousness development is the fundamental impossibility the foreknowledge of the final result of the development.

The approach to human intellect as the complex system of cognitive processes that provides gaining, saving and using knowledge is studied by cognitive psychology. The history of the study of cognitive processes in children with intellectual disorders in Russia reduces to G.Y. Troshin's conception that implies hierarchy of mental disorders conditioned by the defeat of the brain.

This scientist emphasized that organic lesion of the Central nervous system causes mental retardation, that in its turn, follows a row of mental disorders in intellectual, emotional, and goal setting areas, as well as disorders of language, memory, attention, sensation systems.

Cognitive abilities in the process of individual development are subjected to changes. L.S. Vygotskiy [1983] concluded that human intellectual development is based on the conversion of cross-functional structures, [4, p.242].

According to the theory of B.G. Ananyev [1977] human intelligence is integrated system of cognitive processes. By his opinion, human intellect structure is reduced to the intra and cross-functional relations, that can be identified with the help of the correlation and factor analysis (cognitive differentiation – is an integrity, leading mental process and so on). The integration degree of cognitive processes serves as an indicator of intellectual development. The integration characterizes by increase in the severity of some cognitive functions as well as by strengthening the cross- functional relations between them. The growth of the quantity and amounts of correlations interprets as the measure of cognitive

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functions' integrity and as the indicator of the formation of an integrated intellect structure.

N. A. Bershtein (1947) had studied hierarchical level system of motor functions', cognitive- motor activities regulation and according to that some clinicians defined five forms of motor disorders occurred in children with intellectual disorders.

Hierarchical structure of human intellect is studied in the works of B.M.Velichkovskiy and M.E. Kapitsa (1987). The development of human cognitive processes considered by them as a two-way process: the first way is connected to the formation of the operational components of action and control strategy, the second one is formation of intentional and individual features of intellect. Efficiency of intellectual activities also depend on unrelated with it processes. They are motives and emotions [3,p.133].

The hierarchical similarity of intellect models and motor intellect e.g. definite architectonics of cognitive development structures at each age stage is obvious. Though considering normal and impaired intellectual development it is possible to define the common points of intersection and more complex hierarchical relationships which appear during human objective activities and communication and characterized by the levels' construction of basic and background mental functions.

V.D. Shadrikov (1994) has suggested the scheme of functional abilities' system that in its basic components corresponds to the architectonics of the functional system of human labour activities. But the content of the each component is specific for each abilities as well as various in objective activities. He comes to the conclusion that it is possible "to describe the structure of mental functions just as psychological structure of activities and development of abilities - just as system development that realizes this function, just as the process of system formation".

There is a huge of the accumulated materials about internally contradictory nature of age dynamics of cognitive abilities (including the abilities of different modalities), irregularity and unevenness of their development (B.G. Ananyev, P.K. Anokhin, L.S. Vygotskiy, N.C. Leites).

P.K. Anokhin (1975) highlights two main types of the irregularities: intrasystem and intersystem ones. Intrasystem irregularity manifests itself in simultaneous foundation and different temps of the maturation of the specific fragments within the same functional system. It implies different degree of complexity of the fragments. Intersystem irregularities defines the foundation and development temps of those structures which human body needs in various periods of its postnatal development [1].

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The basic tendency of the age variability of intellectual function relationship's structure are the increase in the number of connections and their frequency; regrouping of central components of the intellectual functions. The differentiation periods change the periods of integration but at a higher integrative level. At a younger age levels of maturity prevail the relative autonomy, independence of the psycho-physiological functions.

The structure conceptions had played their leading role in W. Scott's cognitive theory of personality. He emphasizes the fundamental significance of the study of cognitive structure process' features in opposition to its content features.

He defines the cognitive structures as "the structures whose elements consist of ideas, deliberately adopted by the person in her/his phenomenal image of the world" (W. Scott, D. Osgood, C.Peterson) [7, p.145].

The concept of complex and multifactor determinism of psychic development justifies the united theoretical approach to understanding the regularities of children's normal and abnormal mental development. Under this approach there is principal concept about the coincidence of the most common patterns of children's normal and abnormal mental developments.

The common patterns of the mental development considered as those that inevitably show the children with normal and impaired intellectual development during the adoption of social human experience in the processes of education, learning and communication.

The first place among the number of such intellectual development regularities take the qualitatively new features and formations occurred during the interaction of the forming personality with the social environment. The regularities are common, because they reflect, for example, mental development's positive changes in children as with normal as well with impaired intellectual functioning by one general condition: availability of the active interaction of the subject (personality) with the environment. The general regularities of mental development also are reveal the fact that children with impaired intellectual functioning: "save all the stages of mental development with the same sequence as in norm but with changed time limits of the stages. There are sensitive periods in the development of different mental functions with the possible delay of the time of their coming and ending (termination). The forms of leading activities are regularly updated at different development stages..." [4,p.4].

The frequent combination of such adverse factors has defined the focuses of modern investigations: the studies of

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schoolchildren's cognitive normal and abnormal intellectual genesis' development in relation to different social status, the conditionality of mental disorders and cognitive development retardation by the degree of social and personal development, as well as by the factors of psycho-motor dynamics and social adjustment.

The author presents data on investigation held among schoolchildren aged 7-18 (SPO, VO , Stavropol (2000-2015)/. According to the author's concept, under the specific features of intellectual development we consider not just exclusively negative features of motivational and personal, intellectual, emotional and other dynamics in schoolchildren with different levels of intellectual functioning. There are some coincidences with other scientists' conceptions of cognitive processes' dynamics (their conceptions are the above-mentioned in theoretical and experimental parts), but there are also some divergence of views. That is determined primarily by the contingent's specificity and by the lack of the data presented by the other authors on cognitive and intellectual, cognitive and motor dynamics in children with intellectual disorders.

The author of the article has studied the cognitive development differences in groups of children (girls) with normal (DN) and impaired (DNN) intellectual genesis using non-parametric H-criteria Kruskal – Wallis and Median – test that demonstrates changes' degree of the features in a selection.

We can see the similarity of intergroup differences in cognitive intellectual and cognitive motor factors in the valid level of significance between DN and DNN (scheme 1). The group DNN (unlike MN) has got some intergroup differences in memory's characteristics (direct, easy memorization, fatigability, attention activity). The group DNN has shown lower quantitative indicators than those in the group DN. Intergroup differences in cognitive-motor development combine the features as follows: the mobility of the nervous system, muscle strength and residual stress, the level C 1.

The group MNN has demonstrated more pronounced residual stress at 18 - aged interval that shows physical development as well as will strengthening. This proves the relationship between cognitive- motor and individual characteristics of schoolchildren as well as demonstrates gender development aspects.

Also the group DNN as well as the group DN has got some intergroup differences in mobility of the nervous system but there is rather irregular dynamic in different age groups and their quantitative indicators.

There are intergroup differences in space adoption and accuracy requirements during the motion processes in DN and DNN

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groups (the level C.1.).

Groups N	Kruskal-Wallis	Median - test	Groups NN	Kruskal-Wallis	Median test
P	P		P	P	
Objects' characteristics	0,0015	0,0416	Objects' characteristics	0,0083	0,0105
Correcture	0,0007	0,0021	Correcture	0,0007	0,0003
Munsterberg test	0,0001	0,0054	Munsterberg test	0,003	0,0372
10 words	0,0019	0,0038	10 words	0,0139	0,0074
Similarities	0,0067	0,001	Similarities	*	0,019
Generalization	0,0067	*	Logical series	0,0188	0,0246
Circles	0,0044	0,0024	Circles	0,0425	*
Self-esteem adiquacy	0,0001	0,0022	Self-esteem adiquacy	0,0043	*
IQ	*	0,0237			
MTD	*	0,014			
Mobility of the nervous system (the quantity of movements).	0,0043	0,0204	Mobility of the nervous system (the quantity of movements).	*	0,0081
ЧВ	0,0492	0,0025			
ЧУ	0,0025	0,0169			
MC (kg)	0,0009	0,0035	MC (kg)	26,01923	*
OY (kg)	0,0007	0,0015	OY (kg)	0,0255	0,0293
Level C1	0,0322	0,0295	Level C1	0,0442	

**Scheme 1. Intergroup cognitive- intellectual and cognitive – motor differences in DN- and DNN- groups.**

So, the author has studied and analyzed the specifications in indicators of symptoms' severity within selections and has highlighted the significance of gender aspects of cognitive-intellectual, cognitive – motor development and individual features of the schoolchildren as well as confirmed the reliability of the indicators.

Author analyses also cognitive development dynamics by

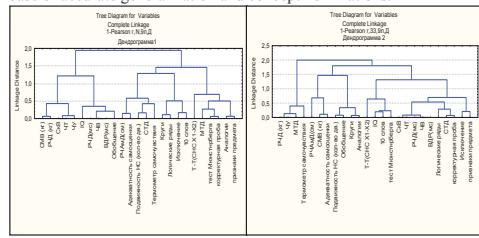
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means cluster analyses, with the help of Dendrogram method (hierarchical trees), to define the relationships' change mechanism at all stages of the experiment. The Dendrogram method the author has used in experiments with children with normal and impaired intellectual development's genesis, under condition:  $0 \leq -1-R \leq 2$ ;  $-1 \leq R \leq 1$ .

Taking into consideration the positive indicator dynamics in each age groups the author of the article has studies just those of significant relations and cluster's contents that had been before the experiment and those in the dynamics of cluster indicators in a duplicate experiment .

Due to the fact the author considers cognitive development of normal and impaired intellectual genesis, the basic criteria of the investigation has been defined as intelligence quotient (IQ), so the corresponding clusters containing this indicator had been analyzed.

The girls of nine years old with normal intellectual development (DN) have demonstrated positive connections in speed and temp indicators that in their turn are interconnected with the sense of effort in reliable significant level ( $p < 0,05$ ) and interact in the cluster with muscular endurance and different sensitivity. There is some motor components' interaction in the cluster. The cluster contains the following data: the sense of time, the time of motor response (MR), distinctive motor sensibility range, that in their turn correlate to analytical and synthetical, verbalization abilities on the base of accurate generalization and concept nominations.



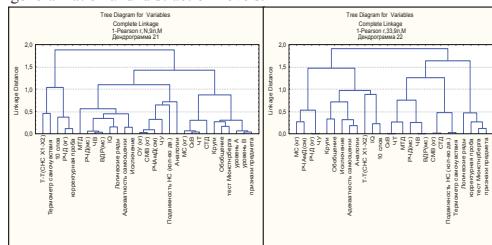
### Scheme 1.2. The girls of 9 years old.

The nine year old girls with intellectual disorders (DNN) have got positive connections among the sense of efforts and distinctive motor sensitivity (kg), that in their turn have got close relationship with the maximum motion rate and psycho-physiological indicators, self-esteem at the moment of the test time

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and motor differentiation. That is also interrelated to cognitive-motor and personal components. Speed endurance and sense of pace (temp) have got positive connections to different motor sensitivity (mc) and the sense of time. The IQ- indicators of girls with abnormal intellectual development (DNN) correspond to memory indicators (easy memorization), fatigability, attention activity and the selectivity and resistibility that forms positive connections and lies in the cluster correlating with nervous system's indicators.

The nine year old boys with normal intellectual development (MN) have showed that distinctive motor sensitivity (kg) correlates to the volume and concentration of attention, easy memorization, and in their turn they have got positive connections with psycho- physiological indicators (self-esteem and the determination of well-being at the moment of the test) and the strength of nervous system in reliable significant level. The sense of effort has got positive connection with different sensitivity of motion amplitude (sm), static muscular endurance (kg) and residual stress (kg). The IQ indicator in the presented number data correlates to the logical ability as well as to the time of simple motor reaction (mc), the sense of time and distinctive sensitivity of movement according to the time variable. The data are in one general cluster and make positive connections with adequacy of self-esteem, generalization and distraction levels.



Scheme 1.3. The boys of 9 years old.

The results of experiment held in the group of nine year old children with intellectual disorders (MNN) have shown that the children's sense of effort and static muscular endurance (kg) have not got positive connections in reliable significant level. The IQ verbal indicator corresponds to memory status (easy memorization), fatigability and attention activities.

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All the above-mentioned interrelations of cognitive development indicators during the duplicate experiment approve the hypothesis according that cognitive development implies all the components' interactions and conditions the dynamics of the development of normal and impaired intellectual genesis.

Girls and boys with normal and impaired intellectual development have shown positive connections to the indicators that have got dynamics and to the indicators of verbal intellect (IQ) during the duplicate experiment. In their turn these indicators correlate to cognitive-intellectual and cognitive motor development rate.

The dynamics demonstrated in the duplicate experiment has approved the author's hypothesis implying that cognitive development of impaired intellectual genesis is realized through motor processes, through spontaneous motor activity.

So, resuming the investigation the author makes conclusions as follow:

1. The set of considered qualitative and quantitative indicators of cognitive development are the reliable data on holistic assessment of general genesis (cognitive-intellectual, cognitive-motor, cognitive-personal development) as well as is the base for formation of individual profile of the children with the development of normal and impaired intellectual genesis.

2. The complex research of schoolchildren cognitive development has shown that children with intellectual development's disorders demonstrate the cognitive- intellectual dynamics realizing through motor processes, spontaneous motor activity (e.g. the activation of "background" movement levels).

3. Considering the concept of intellect as a hierarchical structure the author of the article emphasizes its similarity to the level theory of movement construction. The intentional and personal feature is the basic one and considers as the particular aspiration, directivity of human mental activity. It is the component of two-way process of human cognitive development implying more complicated hierarchical connections and revealing themselves in the course of objective activity, socialization ; characterized by a number of levels in the construction of leading and subsidiary psychic functions.

4. The children with the development of normal and impaired intellectual genesis in the cognitive and motor processes demonstrate smaller differences than in cognitive- intellectual ones, that suggests that schoolchildren with intellectual disorders have got the higher level of cognitive – motor development.

5.The analyzed data in the severity of symptom's degree

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within selections revealed gender specifications of cognitive development.

6. The cognitive- motor schoolchildren's development of impaired intellectual genesis differs from the norm, but with age increases the productivity and accuracy (distinctive motor sensitivity, the sense of effort and so on), that implies positive dynamics of such features as sensibility, endurance, functionality, reactivity.

7. There is the direct correlation between the school-age children's learning efficiency and the development of cognitive and motor processes: the positive correlations of the verbal intellect indicators, cognitive and intellectual ones to the indicators of cognitive and motor development in reliable level of indicators' significance.

#### **References:**

- [1] Anokhin P.K. Essays on the physiology of functional systems. M: Medicine, 1975, 448 p.
- [2] Astapov V.M. Introduction to defectology with the basics of neuro - pathopsychology. M: The international Pedagogical Academy, 1994. 216 p.
- [3] Velichkovsky B.M., Kapitsa M.S. Psychological problems of study of intelligence, Intellectual processes and modeling. M: Nauka, 1987. p. 120-141.
- [4] Vygotsky P.S. Problems of mental retardation // Vygotsky PS works in 6 T. T. S. M: Longman, 1983.
- [5] Sorokin V. Special psychology. SPb.: Speech 2003. 216 p.
- [6] Kholodnaya M.A. Psychology of intelligence: the paradoxes of the study. SPb.: Peter, 2002. 272p.
- [7] Scott W.A., Osgood D.W., Peterson C. Cognitive structure: Theory and measurement of individual differences. Washington: DC.-Winston, 1979. 145 p.