Complex Development of Cognitive Processes and Physical Abilities of Children of Preschool Age in the Process of Motor Activity

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ABSTRACT
Background: The article is devoted to the problem of physical and psycho development of children of preschool age in the process of motor activity, namely, the substantiation and development of psychological and pedagogical conditions that will promote the activation of cognitive processes of children in the process of physical exercises. An exceptional value in the formation and development of the personality of the child has timely physical development, which is the basis of the successful activity of the combination of higher mental functions, which determines the need for their integration for the general development of the child. Methods: The research of physical and psycho development of preschool children during motor activities was conducted at preschool educational institutions №. 9 "Sonechko" and № 10 "Liubavonka" in the town of Pereiaslav-Khmelnitskyi, Kyiv region in 2015-2016. Investigated contingent were girls and boys of the 4th, 5th and 6th years of life, pupils of pre-school educational institutions, only 261 children. Monitoring of psychophysical development of children was carried out with the help of medical staff, pedagogical staff of pre-school educational institutions and with written consent of parents. Results. To determine the availability and informational significance between the components
of the personality of preschoolers, a correlation analysis was conducted between the indicators of physical, psychophysiological status and the development of speech of children 4-6 years old. The obtained results became the basis for the development of psychological and pedagogical conditions for the integrated development of cognitive, communicative and motor activity of preschool children, which included: the creation of a developing subject-spatial environment for the development of mental abilities and speech in the process of motor activity; purposeful use of technologies that promote the integration of physical and psycho development (articulation gymnastics; fingernail gymnastics; corrective and respiratory gymnastics; logarithmics; varieties of childhood fitness); increase of professional competence of teachers in the issues of organizing speech and psycho sphere development in the process of motor activity of preschool children; organization of educational interaction with parents concerning physical, intellectual and speech development of children. Conclusions. The organization of integrated communicative-motor work with children envisages realization of the following provisions: active introduction of health-saving technologies; organization of leisure activities; creation of a communicative developing subject-space environment.

1. Introduction

Socio-economic changes in the Ukrainian society, processes of globalization and informatization have led to an increase in the role and significance of each individual, the success of his individual development. This leads to the need to find ways to optimize the education and upbringing of the younger generation, in particular children of preschool age.

Preschool children - the most crucial period in shaping a person's identity (its constituent physical, intellectual and moral qualities), psychological and physical development. This age is a sensitive period for the development of communicative and emotional sphere of pre-schoolers.

The significance of the development of speech and mastering in the native language is unrivaled in the comprehensive development of a child of preschool age. Language is a means of communication in society and knowledge of the surrounding world. Acquiring speech is a prerequisite for the education, training and development of children. Child communication development requires a purposeful and systematic work of teachers and parents, use specific educational tools and methods is the result of a combination of various components of mental development [1, 2, 3, 4].

An exceptional value in the formation and establishing of the personality of the child has timely physical development, which is the basis of the successful activity of the combination of higher mental functions. Ensuring optimal psychomotor development of a child is possible only as a result of targeted pedagogical influences that occur in the process of physical education. It is physical education considered modern pedagogical and psychological science as a special kind of activity that promotes the education of the best physical, moral, intellectual qualities, as well as - the development of mental processes and is associated with the formation of a coherent, harmonious person and his health.

Literature Review

This position is confirmed by studies of S. L. Rubinshtein [5], A. V. Zaporozhets [6], N. M. Anykeeva [7], L. I. Bozhovich [8], I. D. Bekh [9], E. S. Vilchkovskiy [10], J. Walker [11], J. Iverson [12] and others.

It is known that in early childhood biological need to move and exercise is leading mobilizing effect on the
intellectual, moral and emotional development of the child's habits and behavior [13, 14, 15, 16].

A number of researchers note the existence of the relationship between intellectual, moral, speech, social development and motor activity, physical fitness, the state of the child's health [1, 17, 18, 5], that determines the expediency of such a system of education and upbringing, which provides an integrated educational, health-improving effect.

Thus, the exclusive role of physical, psycho and speech development of younger generation determines the need for integration for the overall development of the child.

But, researchers [10, 19, 16, 20] mention, that one of the crisis phenomena of domestic traditional and author systems is the gap between physical education and other aspects of upbringing children of preschool age, the lack of real mechanisms that determine the integrity of the child's development of the motor activity. Some aspects of solving this problem were considered in the researching of: A. A. Pyvovar [21], which was devoted to the combined development of physical and cognitive abilities of children of 5-6 years in the process of physical education; V. V. Polishchuk [22], who substantiated the content of classes on the physical education of older preschoolers with the priority use of tourism elements to increase the level of physical fitness, mental development, speech and physical health; in dissertation work of Ye. Yakhno [23] defined pedagogical conditions of complex development of physical abilities and formation of moral qualities of children of 5-6 years in the process of physical education.

The question of the formation of the integral personality of a child of preschool age, the relationship and interdependence of the development of its main structural components in the process of physical education was the subject of research of doctoral dissertation of N. Panhelova [16].

As for the issue of child's psycho-emotional sphere development in the process of physical education, only episodic data are available in literature available to us [24, 25], which determines the relevance of our research.

The urgency and significance of the problems of the integration of psycho and physical development are also determined by the practice of preschool education. There is a contradiction between significance overall language development for preschoolers, using the potential of integrated motor-speech activities in education and the practice of pre-schools in the form of the examined studies with inadequate teachers use special methods and tools.

**The goal** - to prove and develop psychological and pedagogical conditions that promote language development of preschool children in the process of motor activity.

**Tasks:**

1. To determine the availability and informational significance of the interconnections of the main components of the physical, psychophysiological state and speech of children of preschool age.

2. To determine the organizational and methodological principles of realization of psychological and pedagogical influences which are directed on the integrated development of motor qualities, cognitive abilities and speech of children 4-6 years in the process of physical education.

3. To determine the effectiveness of the proposed approaches to the integrated physical and psycho development of children in the educational process of preschool education.

**Materials and methods**

In our studies, the following methods and techniques were applied:

- analysis of data from literary sources and generalization of experience of best practice of physical education of children of preschool age;

- pedagogical methods: pedagogical observation, pedagogical experiments (assertive, molding), pedagogical testing;
psychological methods: diagnosis and research of cognitive processes (perception - the techniques "Recognize who it is?", "What are the objects hidden in the pictures?";
Attention - "Find and cross out", "Put icons"; imagine - "Create the story", "Create the game"; memory - "Remember the drawings", "Remember the figures"; figurative logical thinking - "Fables", "Sections on groups"; [26, 27] speech (technique - "Spell the word", "Tell us by drawing" [26, 3];
- anthropometry;
- physiological (pulsometry, spirometry, functional tests Shtubge, Gench, Ruffer);
- methods of mathematical statistics (the definition of the arithmetic mean of the variation series (x), the mean square deviation (S), the mean arithmetic mean (m), the comparison and determination of the reliability of the differences between the individual groups using the student's t-criterion, correlation analysis, the calculation of the rate of increment of the result of Brody index.

The research was conducted at preschool educational institutions №. 9 "Sonechko" and № 10 "Liubavonka" in the town of Pereiaslav-Khmelnitsky, Kyiv region in 2015-2016. Investigated contingent were girls and boys of the 4th, 5th and 6th years of life, pupils of pre-school educational institutions, only 261 children. Monitoring of psychophysical development of children was carried out with the help of medical staff, pedagogical staff of pre-school educational institutions and with written consent of parents.

Results

The study of the dynamics of components that ensure the implementation of motor activity, intellectual and speech development of preschool children can be determined in the planning of pedagogical actions, tools and methods that are aimed at integrated psychophysical development of the child.

However, the substantiation and development of the psychological and pedagogical conditions of the combined development of motor, mental, moral qualities and speech of children of preschool age in the process of physical education requires the study of interconnections and interdependence of all components that ensure the functioning of the motor system and the psycho-emotional sphere of the child [16].

Studying the interactions of components for the operation of the child's body as an integrated system allows for correlation analysis method to carry out the development component ratio pedagogical actions.

The interconnections of all components of the physical condition, the intellectual sphere and the speech of children were analyzed at three correlation levels: high - $r = 0.7-0.99$; the average $r = 0.31-0.69$; low - $r < 0.3$.

In the process of analyzing correlation matrices, calculations of the mean values of the interconnections of each indicator with others were made additionally. For this purpose, all values of the correlation of one indicator with others were added, and the mean value indicated its significance in the structure of motor readiness, intellectual and speech development of preschool children.

In this article we will present a fragment of our study that relates directly to the interactions of the motor system and the cognitive-communicative sphere of children of 4-6 years. The analysis of the correlation matrices of the morphofunctional state, physical fitness, cognitive processes, and the speech of girls and boys of 4 years old indicates the existence of interconnections of the middle correlation level that characterize physical development, functional capabilities, the level of development of physical and intellectual abilities of children, as well as components speech development.

Studying the interconnections of indicators of components of intellectual, moral and speech development with indicators of the morphofunctional state of girls and boys of this age, we have found the presence of similar trends in their interdependence. There are interconnections between the indicators of cognitive processes and functional state at boys and girls. The interdependence between the indexes of thinking, imagination, attention, speech and functional state
of the cardiovascular and respiratory systems ($r = -0.31-0.57$) was revealed. But the girls traced a close correlation between cognitive abilities and some anthropometric parameters. Thus, the girls found correlation between the level of perception, memory and thinking with the rate of body length ($r = 0.37-0.42$). The boys were found only indirect relationship with the functional state of intellectual development. The average correlation is observed between the development of speech and the cognitive sphere of the child ($r = 0.40-0.66$), which is logical, taking into account the theory of age development. It must be assumed that the development of the intellectual sphere of the child and the formation of speech depends to a large extent on the pace of his physical development (indicators of which are body length, body weight, etc., indicating compliance (or mismatch) with age-related growth rates.

One of the main issues of our study is the study of the relationship between physical preparedness and components of the intellectual and speech development of preschoolers.

Confirmation of the presence of the tendency of interdependence of the development of physical and intellectual abilities, both in boys and girls of 4 years of age in the indicators of perceived dynamometry ($r = 0.37-0.46$) and imagination ($r = 0.37$). The girls also found a correlation between vestibular resistance and such cognitive processes as perception and memory ($r = 0.39-0.44$), which may indicate that the concentration and lability of the nerve processes that cause the manifestation of coordination abilities, greatly affect the development of the sensory-perceptual sphere of the child. In the case of boys, they have found more interactions between physical and cognitive abilities. One can speak of the existence of interdependence between the indicators of speed, speed-strength abilities and perception ($r = -0.33-0.29$); speed-strength abilities (jump in length from place - $r = 0.28$) and memory; Power (dynamometry - $r = 0.37$), speed-power (jump in length from a place - $r = 0.33$), speed (tepping test - $r = 0.26$) abilities and imagination.

Analyzing the correlation between the indicators of the motor system, the components of intellectual and speech development of children for 5 years, we observe some differences in the correlation of these relationships. In 5-year-olds, the integration of speech with intellectual processes is in a lesser degree than in 4-year-olds, which can be explained by the fact that in the older preschool age, the process of differentiation and integration of speech in the system of cognitive functions takes place. Speech becomes a separate and regulated intellectual process. But found quite close links between the girls and speech function cognitive processes such as perception ($r = 0.40$) and attention ($r = 0.47$), which contributes to the cognitive attitude to the language (the child learns the native language in laws the process of verbal experimentation). In boys there is a correlation of speech with indicators of speed-strength and coordination abilities ($r = -0.35-0.45$). We believe that this is due to functional maturation of the nervous processes, which to a certain extent determine the manifestation of these abilities, which, in turn, contributes to the formation of new forms of speech - contextual and explanatory, which form the basis for the coherent speech of the child (Pic. 1). By studying the results of studies on the presence and nature of the relationships of the components of cognitive processes with the morphofunctional state of children of 5 years of age, we found that the indicators of perception, memory, thinking and imagination, both in boys and girls, correlate with physical development ($r = 0.25-0.42$) and the functional state of the cardiopulmonary system ($r = -0.25-0.46$), which may indicate an interdependence of the child's psychophysical development.

Analyzing the results of studies on the presence and nature of the relationships of the indicators of the cognitive-speech sphere with the morphofunctional state of children 6 years old, we found that the level of manifestation of such cognitive processes as perception and memory to some extent depends on the functional state of the cardiorespiratory system as in boys and girls ($r = -0.39-0.33$)(Pic. 1).

In boys, meaningful relationships were recorded only between such cognitive processes as thinking and imagination with the development of speech ($r = 0.35-0.60$). Perhaps this is due to the fact that the formation of speech
as a separate intellectual process in boys occurs later than girls.

Thus, the existence of reliable correlation relationships between physical development, functional state, physical abilities, intellectual processes and speech development of children of 4-6 years testifies to the possibility of a comprehensive influence on the physical and mental health of the child.

The obtained data became the basis for the development of psychological and pedagogical conditions for the integrated development of cognitive, communicative and motor activity of preschoolers.

It is known that integration is a combination of knowledge in various educational fields that complement each other [20]. A prerequisite for the integration of motor and communicative activities is the commonality of management mechanisms for various activities.

Integrated health and fitness classes make it possible to solve problems in education and upbringing, and increasing their physical activity. Such classes are built on the basis of the game method, since the main kind of activity in the preschool age is the game. In one plot combines various gaming tasks and exercises of didactic and developmental character; special exercises, tasks for the development of speech; Exercises for the development of speech matching with movements; mobile games, as well as - basic movements, drill exercises, exercises of a sporting character. Special exercises include elements of various types of gymnastics (articulation, fingers, respiratory).

Finger gymnastics is performed in combination with other movements (for example, with walking), which contributes to the development of coordination, small motility, amplitude of movements. In addition, such exercises help to improve memory, develop creative abilities and speech of the child [25].

The content of integrated classes should be based on the mastered program material. Such classes help to improve the motility and development of cognitive processes of the child.

The purpose of the integrated communicative-motor activity is to ensure the interconnection of the processes of physical education and the development of speech for preschool children.

The tasks of the integrated communicative-motor activity are [16]:

• increasing the interest of preschool children in physical education;
• expansion of vocabulary, activation of speech activity of children;
• development of memory, attention, small and general motility, coordination of movements, coherent speech;
• use of some forms of speech activity in independent motor activity.

In the process of integrated classes various tasks are solved, children learn the content of different sections of programs in parallel, which allows you to save time for gaming and independent activities.

Game activity - the main component of motor activity of children. That is why the integration of communicative and gaming activities takes place precisely on the basis of gaming activity.

Preschoolers are easily involved in the game, during which prevails positive emotions, the desire to show the best, so it is expedient to stimulate children's desire to show themselves in different types of motor activity. Specially selected games of different intensity, relay games, fun games develop fine motor skills, coordinate movements, stimulate the development of children's physical, psychomotor and intellectual abilities, and increase their creative potential.

It is possible to highlight the following positive features of integrating lessons:

• ensuring the improvement of motor skills and abilities;
• mastering a variety of knowledge in the process of motor activity;
• increase motivation for motor, gaming, educational activities;
• creating a positive emotional mood;
• formation of cognitive interest of preschool children;
• to a greater extent than ordinary occupations, promote the development of speech, the formation of the ability to compare, generalize;
• enriching the outlook, forming a child's harmoniously developed personality;
• promoting emotional development of children, as they include elements of music, literature, plastic, etc.

As already pointed out, the purpose of our research was to develop psychological and pedagogical conditions for the development of child's speech and cognitive abilities in the process of motor activity, therefore, it is necessary to determine with understanding the definition of "psychological and pedagogical conditions".

According to N.V. Zhuravskaya [28], psychological and pedagogical conditions are considered as such conditions that are intended to provide certain pedagogical influences, the development of the personality of subjects or objects of the pedagogical process (teachers or pupils) and which will contribute to improving the efficiency of the educational process. Thus, the creation of psychological and pedagogical conditions for the full development of speech of the child in the process of physical activity, the games involves:

• creation of a developing subject-spatial environment for the development of speech (systematization of a variety of methodical material for conducting mobile games with the inclusion of speech: game materials for articulation, sets of toys and methodical material for the development of fine motor hands, touch cubes, etc., updating visual-didactic manuals for the development of speech, etc.);
• purposeful use of technologies that promote the integration of physical development and speech (various types of gymnastics: fingers, articulation, respiratory, fitbol aerobics, rhythmics, logoaerobics, classes in the dry pool);
• enhance the professional competence of teachers in the organization of speech motor activity during preschool;
• organization of educational interaction with parents concerning physical and speech development of children.

The criteria of the effectiveness of the developed program were the dynamics of indicators of the morpho-functional state, physical preparedness, cognitive processes; the formation of components of moral development of children.

In experimental groups, the process of physical education was built on the basis of the developed structural model of formation of a harmoniously developed personality preschool in the process of physical culture.

We proposed to include elements of innovative pedagogical technologies of physical education that contribute to the complex development of the child's personality, in conjunction with the program material for teaching and upbringing children of preschool age, to all organizational forms of work in physical education. In control groups all organizational forms of classes were conducted in accordance with the content and methodical recommendations of the program of education and training of preschool children "I am in the World".
Pic. 1 Correlation interrelations of indicators of physical condition, mental, moral qualities and speech of girls of 5 years old

In order to verify the effectiveness of the introduction of the proposed technology in the process of physical education of the preschoolers of the proposed technology, we conducted a comparative analysis of the indicators of the morpho-functional state, physical preparedness, cognitive processes and moral development of children of control and experimental groups that were obtained after the end of the main stage of the pedagogical experiment (June, 2016).

Pic. 2. Changes in the physical fitness of girls and boys 4 years of study group after the experiment:
1 - running 30 m; 2 - long jump from place; 3 - lifting the trunk in the seat; 4 - slope forward, standing on a bench; 5 - maintaining equilibrium; 6 - "shuttle" running 3 × 10 m; 7 - running 90 m;

- control group, girls;  ▤  experimental group, girls;

- control group, boys;  ▤  experimental group, boys.

Comparison of the data obtained during the pedagogical experiment shows that in experimental groups of children 4, 5–6 years (boys and girls), there are significantly higher results (p <0,05) in indicators of morpho-functional status, physical preparedness, cognitive processes and moral development, which confirms expediency of using the method of complex development of motor, mental and moral qualities of preschool children in the process of physical education (Pics 2, 3).

Analyzing the results of studies on the physical preparedness of children 4, 5 and 6 years old, it should be noted that all indicators had positive changes in the experimental and control groups, both in girls and boys, but at different rates of their growth. The calculated t-criterion of Student makes it possible to talk about the significant advantage of children of experimental groups over their peers in the indicators of physical fitness, which is clearly observed in girls and boys of 4-6 years of age in the indicators of coordination and speed-strength abilities, the strength of the muscles of the body, speed and endurance. However, in boys and girls 4 and 5 years old, girls of 6 years of age, unlike boys 6 years (p <0.05), improvement in physical ability, such as speed, in experimental groups is not reliable (Pic. 2).

Results of application of standardized complex of psychodiagnostic methods during the pedagogical experiment allow to assert a significantly higher level of development of all cognitive processes and speech in children of experimental groups compared with control (p <0.05). This is especially clearly observed at the age of 4 to 5 years, where the highest rates of growth in the indicators of all cognitive abilities were recorded, such as: perception (boys - 23.3%, girls - 24.1%); memory (12.8% and 18.1% respectively), thinking (14.3% and 16.1%), imagination (11.1% and 17.2%), attention (9.2% and 14.1%), broadcasting (28.8% and 14.8%) (Pic. 3).
Pic. 3. Changes in indicators of cognitive abilities and speech of girls and boys of 5 years of study groups after the experiment::

- control group, girls; experimental group, girls;
- control group, boys; experimental group, boys.

Discussion and Conclusions

Thus, the organization of integrated communicative and motor work with all participants in the educational process, the formation of a culture of healthcare through the creation of a special educational environment aimed at ensuring the physical development and speech of children in kindergartens and families, provides for the implementation of the following provisions:

1. Active introduction of healthcare and health-forming technologies, the use of innovative forms of physical and speech development, which include a variety of recreational gymnastics (respiratory, corrective, relaxation, figurative-rhythmic).

2. Use of various forms, means and methods of exercises on the basis of health-oriented education.

3. Organization of leisure activities (sports forms of leisure, sports holidays, walks-tours, etc.).

4. Monitoring the health status and the level of development of preschoolers speech.

5. Attracting parents to joint educational activity of preschool educational institution (registration of visual information aimed at organization of physical culture and health work with a child in a family, organization of optimal motor regime).

6. Creation of a communicative developing object–spatial environment, equipment with modern game and health-improving equipment.

The prospects for further research lie in the development of a set of methodological materials for the combined development of speech and physical abilities of children of 4-6 years in the process of organizing various organizational forms of physical education in a pre-school educational institution (physical education, fitness and recreation activities in the mode of the day, active rest).

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