Questions of Adaptation of First-Graders to School (THE LITERATURE REVIEW)

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ABSTRACT

The article presents the literature review on adaptation of children to process of school training, criteria and clinico-functional features of adaptable processes in children**,** ways of prediction the course of adaptation in children to training at school are described in the article, features of cerebral blood circulation and a vegetative homeostasis in children of primary school age are presented.

Keywords: **a**daptation, first-graders, prediction, adaptive processes, vegetative homeostasis.

INTRODUCTION

The problem of health protection of children and teenagers at the present time is one of the most difficult and actual. The results of numerous researches estimating the state of health in children of preschool and school age inspire serious fears [7, 15, 19, 27, 45]. Against negative changes of ecological conditions, social problems and economic instability we can see the increasing number of children with weakened health, these children enter the school. Such children have difficulty in adaptation to educational activity, development of skills of training, ability to concentrate their attention and to solve educational tasks. Such a condition of an organism reduces the efficiency of the most advanced pedagogical technologies and considerably complicates realization of the program of development of the person [2,32].

The increased number of first-graders with the combined pathology is noted. In disease structure there is a considerable part of diseases of central nervous system, cardiovascular and endocrine systems. The majority of children have subclinical form of diseases that complicates the diagnostics and conducting the adequate treatment. Special attention is required by health of children studying in innovative educational institutions, working with developing educational programs [9, 34]. In the conditions of modern school programs these children can develop disadaptive stress reactions which can influence their somatic condition and progress level. The basic cause for such state of health, according to the majority of researchers, is high academic load [16, 36].

Deterioration of a state of health of schoolboys in recent years defines the necessity of dispensing of academic load according to functional opportunities of the organism, and also

working out of health complexes for prevention and health protection, based on exact estimations of the condition of the organism of each child. The special place in working out of these complexes is occupied by donozological diagnostics of deviations of health, directed to revealing of initial signs of pathology of the leading systems of the organism [17, 21]. The beginning of regular training at school is one of crisis stages in development of the child; it results in serious changes in a way of life and demands great efforts of functioning of all systems of the organism [12].

I. Concept of adaptation

The definition of health as an ability of an organism to adapt for environment conditions gives a key place to the theory of adaptation in the study of health and illnesses. In biology the process of adaptation is an adaptation of a structure and organism functions to existence conditions. The signs and properties which appear to be the most favourable for living beings with the help of which the organism gets the ability to exist in a concrete life environment are formed during the period of adaptation. Adaptation of an organism to conditions of environment can have different character and affect all parts of organization and life activity of the person [1,4].

Reserve possibilities of an organism should be sufficient to support the basic vital constants in normal limits. Adaptation to new conditions occurs due to mobilization of functional reserves and demands certain effort of regulatory systems. In case of change of the environment the organism should change some constants of its functions. There is the reorganization of homeostasis adequate to concrete conditions, it forms the basis of adaptation [6]. These changes occur, first of all, in systems of breath and blood circulation which are responsible for maintenance of organs and tissues with oxygen and nutrients. Therefore adaptive changes of regulatory mechanisms are more likely to appear in the course of regulation of cardiorespiratory system [18, 20].

According to the theory of general adaptive syndrome by Hans Selye (1961), there are three phases of course reactions of adaptation. The first phase – is "emergency" - develops at the very beginning of the action both physiological, and the pathogenic factor or the changed conditions of the environment. Thus blood circulation and breath systems are the first to react. These reactions are controlled by the central nervous system with wide involving of hormonal factors, in particular hormones of brain substance of adrenal glands (catecholamines), which is accompanied by hypertonicity of sympathetic system.

The second phase – is transitional to steady adaptation. It is characterized by the reduction of the general excitability of the central nervous system, the formation of the

functional systems providing management of adaptation to resultant new conditions. The intensity of hormonal shifts decreases, the number of systems and organs which originally were not involved in reaction is gradually increasing. After the transitional phase comes the third phase - the phase of steady adaptation or resistance. It is actually adaptation – and it is characterized by new level of activity of tissue, cellular, membrane elements, reconstructed due to time activation of auxiliary systems which thus can practically function in an initial mode, whereas tissue processes become more active, providing a homeostasis adequate to new conditions of existence. The basic features of this phase are: mobilization of power resources; the raised synthesis of structural and fermentative proteins; mobilization of immune systems.

Nowadays interaction between the organism and the environment is carried out so fast that nature and a human being have no time to adapt mutually, so there is an ecological balance disruption. The transition area between a norm and pathology represents not a homogeneous third condition, but a series of the alternative conditions differing according to the degree of adaptation of an organism to conditions of the environment [2].

II. Criteria of adaptive processes in children

The occurrence of functional and organic changes is preceded by the borderline cases characterized by the decrease of adaptable possibilities of a child's organism to changing conditions of life environment. They appear in the form of numerous signs of discomfort and stress, showing the trouble which is not revealed by usual methods of research [4]. That's why vital importance is given to the search of authentic information criteria, allowing to reveal risk group of children concerning the decrease in level of health to occurrence of organic changes with working out of the differentiated correction.

The important criterion reflecting the course of adaptive process to school is the level of physical development. It is proved, that disharmonious physical development is a prognostic adverse criterion of a course of adaptation of children to school [8, 9]. So, according to V.L.Gritsinskaya (2003) the most difficult adaptive process to regular training at school takes place in children with micro-and macro- somatotypes, as well as in first-graders at whom during the initial stage of training high values of «sthenia index» (above 1, 25), adaptive indicator (above 1,9), decrease in body weight and-or occurrence of disharmony of correlation between length and weight of a body appear.

E.D. Basmanova with co-authors (2009) specifies that as a sensitive indicator of a favorable course of adaptation in first-graders has positive dynamics of physical development in children. A.A. Kuzmina et al. (2006) consider that the deficiency of body weight is the most

frequent variant of deviation in anthropometrical indicators at children of the first year of training at school. At 52,6-71,0 % of the first-graders who have begun their studies at school at 6,5 years at the end of the academic year the prevalence of deviations in physical development [9] was marked.

The difficult mechanism of adaptation of an organism of the child to various levels of the anthropogenous load, directed to preservation of a functional condition and working capacity in inadequate conditions, due to reorganization of energetic, structural and informational levels, forces to consider the central nervous system to be the basic centre of formation of programs of adaptation. The basic mechanism defining the character of adaptation of a human body is the vegetative department of the central nervous system reflecting an integrated condition of somatic functions. Autonomic imbalance is the factor predetermining both the possibility of occurrence, and severity of somatic diseases. The most convenient and informative method of research of a condition of vegetative influences is the analysis of variability of heart rhythm because it is known, that nervous and humoral regulation of heart work changes much earlier, than energetic, metabolic and haemodynamic changes[5,22,31].

The effector system realizing this or that response of the organism, is the cardiovascular system which most sensitively reacts to rather insignificant adverse influences as it possesses a role of the indicator of adaptive reactions of the organism. That's why the revealing of initial deviations will promote in time correction of negative influence of factors of environment. Arterial pressure is one of the major indicators of central haemodynamics. Under the influence of intellectual and physical activities certain changes in level of arterial pressure are observed. Excessively intense educational activity at schools, according to a number of authors, is one of the reasons of arterial hypertension in children [18,20].

Adaptation is directly connected with nonspecific resistance and reactance, i.e. with that background which, finally, defines the risk of development of diseases and health level. The immune system, being one of the major homeostatic organism systems, participates practically in all adaptive processes and is a part of the protective mechanism of the organism. Active participation of the immune system in many vital processes of an organism leads to the fact that disorders of immunoreactivity cause functional and structural variety of appearance of pathologies of the person [1,15].

The circle of healthy functioning includes adaptable reactions of the organism which do not cause disorders in its activity and make norm of adaptation. Disorders in physical development of schoolboys, the increasing number of dysfunctions of cardiovascular and

vegetative nervous system, disease growth indicates, that adaptable mechanisms of children work intensively [4,18,19].

III. Clinic-functional features of adaptive processes in children

Process of growth and development of the organism of the child is in the sphere of interest for teachers, psychologists, physiologists and medical workers. Focused attention involves the development of children during the crisis periods of life during which time formation and development of functional and morphological possibilities and functions occurs more intensively, than during the stable age periods [14,15]. Pupils of primary school age demand special attention to themselves as incompleteness of morphological and functional development, labiality of physiological processes promote the fact that during this period the child extremely sharply reacts to revolting factors of the environment. In spite of the fact that conditions of school and academic loads are far from extreme, the process of adaptation to these microsocial conditions with influence of adverse climatic and ecological conditions of the living region can have the character of the expressed stressful reaction [16].

According to the literature, adaptation of the child to new social conditions, along with development of a difficult kind of activity - training, is accompanied by considerable pressure of the central nervous system, demands high energetic expenses that leads to functional damage of a state of health of children: immunity decreases, loading on regulatory systems increases, the metabolism, the central and peripheral blood circulation change. As a result there are various changes characterized by the decrease of functionality of an organism and first of all of it regulatory systems which level of pressure reflects the degree of adaptation to environment conditions. Therefore there can be asymptomatic forms of a pathology with the long latent period in children, - premorbid conditions which can serve as the base to occurrence of numerous diseases [6,17].

Features of an age stage of 6-7 years appear in changes in all spheres. High functional pressure which tests an organism of the first-grader, is defined by the fact that intellectual and emotional loads are accompanied by long static pressure connected with preservation of a certain pose of the child at work in a class. The period of adaptation at first-graders is characterized by low and unstable level of working capacity, very high level of pressure cardiovascular, sympathoadrenal systems. Discrepancy of requirements and possibilities of the child leads to adverse changes of the central nervous system, to sharp falling of educational activity, to decrease in working capacity and the expressed exhaustion [19, 23, 34, 38].

Physiological and hygienic researches of last years show, that in many respects the ability of the child to adaptation is defined by the structurally functional organization of a brain [10, 25]. It is established that the basis of successful adaptation of the child to educational loadings and to realization cognitive activity is a certain level of a maturity of functional

structures of brain and adequate character of its activity various cortical-subcortical, cortical-stem regulatory systems [25]. Researches of children of 7-8 years has shown, that at this age under condition of conformity of a functional condition regulatory structures to age norm are generated neurophysiological mechanisms of selective modulation of cortical activity, providing selective adjustment of brain structures according to the cognitive problem. Specificity of the functional organization of the cortex at any selective attention in children of 7-8 years consists in absence of interhemispheric distinctions and domination of specific modular (left hemisphere) type of functional interaction of cortical zones in both hemispheres. Comparison of the data received during the research of children, shows relative immaturity of mechanisms of any attention at the training initial stage. Duration of formation of regulatory systems at younger school age and their role in the organization cognitive activity is confirmed in neuropsychological and psychometric researches [10,19,20,41,42].

Development of internal brake action in children of younger school age is at the initial formation stage, it differs by insufficient flexibility and durability, the nervous system of children is not ready to maintain long psychoemotional loadings and pressure. Discrepancy of social requirements and conditions of training of children somatophysical abilities of a growing organism leads to formation of neurotic reactions, frustration of a motility in the form of a hyperdynamic syndrome, reactions of the active protest or the phobic disorders the frequency of which depends on a functional maturity of an organism of the child and a condition of its health. Neurotic frustration in children can be shown by the various disorders which do not have organic nature, disorders of cardiovascular, respiratory, digestive and secretory systems [14, 26, 30, 37].

Children of younger school age have intensive changes of cardiovascular system: the weight and volumes of heart cavities increase, the histologic structure of heart and vessels is differentiated. The most general reaction to stressful influence from cardiovascular system is the increase in frequency of heart contractions, change of structure of its variability and reductions of indicators of haemodynamics connected with frequency of heart contractions. The beginning of regular training is accompanied by low adaptive possibilities, decrease in functional reserves of the cardiovascular system. Deviations of vegetative regulation underlie the formation of functional deviations in primary school age [20, 35, 43, 44]. We can attribute to peculiarities of formation of health in children during different age periods the expressed increase of prevalence of functional deviations and a chronic pathology; we can mention sharp reduction of quantity of absolutely healthy children. The decrease of immune protection more often appears in the form of sharp respiratory diseases. The most expressed growth of disease according to many authors is marked at school age [8, 15].

In the period of adaptation to training it is necessary to consider specific features of the schoolboy. One of the most perspective variants of the account of specific features of an organism of the child for today is constitutional approach. The system portrait of children of three basic constitutional types (centrovert, extrovert and introvert) is based on characteristics of the morphological, vegetative and mental organization of the child and is defined by the following signs. Centroverted children usually have digestive or macrosomatic types of a constitution, average indexes of power, speed qualities and strength. The psychological portrait is characterized by emotional stability, average indexes of aggression, social activity, all-around cleverness, communicative skills [3]. During the research of condition of vegetative nervous system eutonia appears.

The characteristic features of extrovert children are the mesosomatic type of a constitution, the tendency to brachycrania, advancing of biological age in relation to passport, high speed and power indicators and decrease of strength. Features of psychological development of these children are high indicators of figurative thinking at decrease in indicators of logic, memory, attention, discipline. Explosive hysterical character and inflated self-esteem are combined with a leadership position. Sympathicotonia with hypersympathicotonia vegetative reactance is characteristic for them. Introvert children are characterized by asthenic type of a constitution with the tendency to weight deficiency, they have dolichocephalic skull. The motor organization is characterized by low indicators of speed, force and strength. High indicators of memory, attention, logical thinking, and discipline are characteristic for them, but, at the same time, there is a tendency to lower self-esteem, bad mood, phobic anxiety reactions. In children of given constitutional type initial vagotonia with asympathicotonic reactance prevails [10, 42, 46].

Thus, the adaptive period is accompanied by various changes in a functional condition of children: factors of local protection decrease, tension of hypothalamo-pituitary-adrenal, sympathoadrenal and vegetative nervous systems is marked. One of the features of children's organism is heterochronicity of formation and maturing of its separate physiological systems and functions that affects the formation of readiness of the child to training. The success of primary stage of adaptation to school predetermines the general positive result of the adaptation of the child. Transformations to a children's organism occur throughout the first year of training, therefore it is so important to trace features of physical development, dynamics of physiological and psychophysical indicators during this period.

IV. Predicting the course of adaptation in children to training at school

Basic principle of modern medicine is prior development of a preventive direction. The important section in order to prevent the failure of adaptation is to predict the character of the

process of adaptation before the child enters the school, because about 70 % of children in school have different deviations in behaviour (appetite disorders, sleep disorders, disorders of emotional condition, etc.) before entering the school. Predicting the adaptation allows to estimate adaptable possibilities of the child before entering the school and gives the chance to define, how will proceed adaptation of the child during educational process in the first class [11,15,38]. The prognostic stage provides allocation of children with risk of unfavorable course of adaptation. This stage is carried out in children's preschool educational institution for one year and directly before entering the school. The established risk factors of an unfavorable course of adaptation of children to training at school give the chance to carry out stable work for preventive measures.

The most known way of definition of the prediction of adaptation of children to school is based on questioning the parents and drawing up prognostic tables in which the burdened factors of the biological and social anamnesis are presented. The factors of perinatal pathology include gestoses during the pregnancy, obstructed labour which are often accompanied by hypoxia of the brain in child and displays perinatal defeat of central nervous system. Diseases of the first year of life negatively affect maturing of a brain of the child [39].

Development of the child is defined by character of his living environment. Living in incomplete families, remarriage of parents, long separation from parents, severe diseases or death of parents affect the development of the child. The big influence on development of the child has deprivation in a family - loss or restriction of satisfaction of the vital requirements of the child. Disorders of the child's mind are often marked in problem families in which relations between the child and the parents are broken, accompanied with quarrels, conflicts, alcoholism or drug abuse, immoral behaviour of parents. Deprivation in secured family is a substitution of care and attention to the child by other persons (tutors, nurses, grandmothers and grandfathers). Deficiency of attention to the child in a family when even well-groomed, full-fed, carefully dressed child can appear internally lonely, psychologically neglected because nobody is interested in his mood, feelings, and interests. It can also affect mental health of schoolboys [13,29].

The primary school age is the beginning of formation of motivation of the study on which its further destiny during all school age in many respects depends. A number of authors notice, that lowered motivation to training causes regular stay of children in a condition of the psychic tension underlying deep mental and physiological disorders [14, 15, 23].

V. Features of cerebral blood circulation and a vegetative homeostasis in children of primary school age

The estimation of a vegetative tone is one of the basic criteria characterizing features of a functional condition of an organism. Disturbance of vegetative regulation is the factor predetermining possibility of occurrence of somatic diseases. Current activity of sympathetic and parasympathetic departments is the result of multiplanimetric and multilevel reaction of system of regulation by blood circulation changing in time the parameters for achievement of the optimum adaptive answer which reflects adaptable reaction of a complete organism. Adaptable reactions are individual and are realized in different persons with various degree of participation of functional systems. Activation of sympathetic nervous system specifies vegetative disbalance owing to desadaptation [22].

The results of researches have shown that functionality of heart and independent mechanisms of regulation of its activity in children of primary school age are imperfect, adaptive possibilities of heart are lowered, and tension of mechanisms of adaptation is high. Thus tension is most expressed degree in boys, than in girls. In first-graders with prevalence of a sympathetic link of regulation tension of adaptive systems is marked. At the same time in a number of first-graders the expressed overstrain of the device of the central regulation is noticed. It testifies insufficiency of adaptive mechanisms which can be shown by certain changes in a state of health of children. First-graders with the expressed parasympathetic influence on heart function can have initial stages of exhaustion which is found out much earlier, than visible decrease in working capacity. Optimum tension of systems of regulation of heart function can be considered as a condition, characteristic for satisfactory adaptation of an organism of children to influence of the environment [28]. Simultaneously it is established, that the basis of successful adaptation of children to educational loads and realization of the cognitive activity is certain level of a maturity of functional structures of a brain and adequate character of its various cortical-subcortical, cortical-stem regulatory systems [25].

According to the number of authors the majority of children with various types of vegetative dysfunction have the residual effect of natal damages in the form of pathology from cervical department of a backbone, disturbances in vertebro-bazillar system. The condition of hypoxia of brain is accompanied by disturbance of interhemispheric relations and promotes the formation of liquor hypertension in the field of the third ventricle in the location of structures of limbic-reticular complex, that further promotes the formation of syndromes of hypothalamic insufficiency, intracranial hypertension, psychosomatic diseases, including diseases of cardiovascular system. Among the acquired factors provoking the development of vegetative disorders, many authors name the superfluous psychoemotional tension in children, connected with adaptation to school and intellectual overfatigue [4, 32].

The analysis of activity of cardiovascular system in children of primary school age depending on features of a functional condition of brain represents special interest and is necessary for understanding the realization of disadaptive disorders, working out methods of their prevention, predicting and effective therapy [18, 20, 25, 28,35]. It is known, that in comparison with other organs the brain possesses a hypersensibility to the lack of oxygen and nutrients. The brain is protected from decreasing of arterial pressure and hypoxia by a number of physiological mechanisms regulating both general, and cerebral haemodynamics, the basic of which is the reflex mechanism with participation the sinocarotid zone, aorta's depressor and cardiovascular centre in themedulla, being in a direct connection and under the influence of hypothalamo-mezencephal and subcortical vasomotor centres.

The collateral arterial blood supply of a brain, important for maintenance and normal blood-flow, plays especially considerable role in compensation of blood circulation in case of block of one of brain arteries. The great value in maintenance of constant pressure in brain vessels has such a local adaptive mechanism, as presence of double innervation vessels (vasodilating and vasoconstrictive nerves). The activity vasomotor brain centres is connected not only with nervous, but also with humoral influences: increase of level of oxygen slows it down. Last year it was reported about the existence of autoregulation system of the brain blood circulation, which has the direct influence of fluctuations of intravascular pressure upon a tone of non-striated muscles of brain vessels (reduction or their relaxation) therefore, despite considerable fluctuations of the general arterial pressure, cerebral blood flow is supported at constant level [10,25,33,35].

Thus, brain blood circulation is provided by reflex mechanisms, regulated by various levels of nervous system. The leading factor in the mechanism of defeat of a brain is hypoxia. Physiological researches show, that every minute in a brain arrives about 15% of the blood which is thrown out by heart for this period and containing 20 % of consumed oxygen. Therefore owing to even short-term vascular spasms the exchange processes in brain substance are broken, thereby influencing the functioning of neurons. Hypoxia causes activity changes of pituitary-adrenal systems which can cause the further disorders of regulation of a vascular tone and a blood flow.

In pathogenesis of neurologic frustration in case of disturbances of brain haemodynamics the considerable role is played by venous blood circulation. The venous hypertensia, difficulty of venous outflow from the skull cavity can arise as a reaction to hypoxia in case of brain ischemia, and also in case of hemorrhages. The difficulty of venous outflow leads to the development of intracranial hypertensia that in its turn can break arterial blood

circulation, and thus promote the formation of one more vicious circle in pathogenesis of neurologic frustration. At children's age the most frequent reason of paroxysmally coming frustration of brain blood circulation is vegetovascular dystonia with angiospastic disturbances. It is observed more often in girls; sometimes it is genetically caused and appears in the form of periodic attacks of headaches, dizziness, nausea, faints. The occurrence of these conditions is characteristic at excitement, overfatigue, in a stuffy room, at sudden change of position of a body, emotional labiality, unstable arterial pressure [10, 25, 33, 44].

CONCLUSION:

Thus, the analysis of literary data testifies the necessity of the further studying of features of a course of adaptation period in children of the first year of training, including the use of the complex approach including stages of preschool prediction of adaptation. The literature data confirm actuality of the further studying of psychophysical features, a clinic-functional condition with use of functional methods of the research defining the condition of mechanisms of regulation of a vegetative homeostasis, the condition of cerebral blood circulation in dynamics during the first year of training at school.

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