## COGNITIVE ACTIVITY SELF-REGULATION REACTIONS IN PRESCHOOLERS

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S u m m a r y. The brain acts as an integrated self-regulatory system that seeks to preserve the constancy of the internal environment of the body. The system works as a functional tool to help meet all the body's needs, and timely satisfy leading speci □c needs. Failure to meet them leads to the development of stress. Quantitative and qualitative analysis of behavioral, autonomic and self-bioelectrical reactions were used to analyze basic mechanisms of the organization of holistic behavioral act in the process of cognitive activity. The goal of our research was to Ind mechanisms of adaptive behaviors in the learning process and the possibility of early diagnosis of stress conditions in preschool children. The results revealed correlations between behavioral, cardiovascular, and self-regulation of EEG responses in children at preschool age. Thus, it is shown that the compensation of emotional tension and therefore the occurrence of stress in children can be achieved at the expense of behavioral responses, autonomic and central reconstructions of the brain activity. However, behavioral responses of self-regulation are a 'cheap' way to compensate for the emotional tension. Their inhibition is compensated due to the increase in tension of the mechanisms that regulate heart rhythm and reduce interconnections between the front and rear structures of the brain.

K e y w o r d s: emotional reactions, heart rate, stress index, index of functional status, EEG.

#### INTRODUCTION

The brain acts as an integrated self-regulatory system that seeks to preserve the constancy of the internal environment of the body. The system works as a functional tool to help meet all the body's needs, and timely satisfy leading speci □c needs. Failure to meet them leads to the development of stress. Quantitative and qualitative analysis of behavioral, autonomic and self-bioelectrical reactions were used to analyze basic mechanisms of the organization of holistic behavioral act in the process of cognitive activity.

### AIM OF THE STUDY

The goal of our research was to nd mechanisms of adaptive behaviors in the learning process and the possibility of early diagnosis of stress conditions in preschool children. The results revealed correlations between behavioral, cardiovascular, and self-regulation of EEG responses in children at preschool age.

### **METHODS**

Emotional reactions that occur in the process of achieving goal do not depend on will, certain momentary situation (eg, fear), or the end result of the activity. Given that physiological studies have long ceased to be based only on the descriptive side of events, we used methods of metrological evaluation of behavioral symptoms ('proyavlyaemosti') and autonomic self-reactions. Heart rate as the most subtle indicator of the functional state of the organism reflects restructuring-related activity of the subject.

The study was conducted in the group of 5-7-year old children with constant video recording of behavioral responses and monitoring of cardiac rhythm in the second standard lead -AVL and EEG.

We used the technique of approaching target [1, 2], involving an object of bait moving at different speeds on the conveyor.

The assessment of functional state (FS) included the quality and quantity of behavioral reaction indices, i.e. heart rate variability (HRV), mean R-R interval, reflecting the total effect of heart rate variability; stress index (SI), regulatory systems «stress index» = AMO/(2BP×Mo), and the index of functional state of ISF=L×(L/w)×XcpRR, where L is the length of the cloud of scatterogram, w – its width and XcpR-R – average value of the intervals R-R, stress index and the index of functional status which are usually in inverse proportion to each other [3]. Simultaneously EEG recordings were taken from the frontal, motor, temporal, parietal, and occipital regions of the brain.

#### RESULTS

The main indicators of FS enable the evaluation of the activation used by the system as approximate reflex time of focusing on a moving target, and positive and negative emotional responses and reactions of self-regulation [4]

It turned out that when reducing the speed from 400-250 mm/s to 50-10 mm/s emotionally positive response in all subjects consistently gave way to a tentative reaction, then concentration on a moving target was observed, and  $\Box$ nally either passive or active negative reaction and different reactions of self-regulation occurred.

Based on the analysis of behavioral reactions in conjunction with 'stress index' the subjects were divided into 4 groups.

It was found that under high commitment, and strong-willed force 'stress index' increased 2.6 times compared to the initial value.

In group 2 'stress index' increased to 4.9, and FIS (red bars) decreased 2.15 times.

For children from the 3rd group achieving the goal of approaching at low speeds turned out to be a very dif cult task. IN was dramatically increased 5.7 times, ISF decreased 5 times, indicating overvoltage regulation mechanisms of the heart rate.

Children from group 4 were characterized by a complete indifference to what was happening. Both values of the heart rate variability decreased compared to the initial state during execution of the task. This fact complies with our hypothesis about the critical role of reactions of self-regulation in the organization of holistic behavioral acts.

The evaluation of scatterogram showed that the ratio of length to width of the 'cloud' scaterogram (factor 'K') had calm children, this  $\Box$ gure was increased only in the course of assignment. Children's initial disturbance was 1.5-2 times higher than in children from the 1st group observed at the initial state, while continuing to remain high until the end of the task. When the object was moving too slowly, the children had 'clamped' pale, and cold hands.

In the 3rd group of children the coef cient 'K' values were high when receiving instructions, but declined as the job was nearing the end values of this index observed in the 1st group. It should be emphasized that these children concentrated hard and did not take a gaze away from the object, reinforcing the push of a button, bite their lip, etc. Evidently, the children included a system to overcome it (the will).

The opposite picture of the dynamics of coef cient 'K' was observed in children from the 4th group. These children typically perceived the task calmly, con dently accepted the job, but during problem solving they increasingly looked at the experimenter, and their emotional stress tended to increase. They included the behavioral responses of self-regulation, and by the end of the task it led to the increase in the coef cient 'K'.

And  $\Box$ nally, in the last group of children indicator 'K' remained unchanged throughout the study, which may explain the low level of claims of children. Based on these facts, we additionally were able to classify features of determination of preschool children, which is consistent with our earlier work [2, 5].

EEG analysis of children of this age showed that the inclusion of behavioral reactions of selfregulation is reflected in the bioelectrical activity of the brain. So in children with functional delay speech development dramatically reduced the relationship of the frontal and parietal-temporal-occipital connections.

#### CONCLUSIONS

Thus, it is shown that the compensation of emotional tension and therefore the occurrence of stress in children can be achieved at the expense of behavioral responses, autonomic and central reconstructions of the brain activity. However, behavioral responses of self-regulation are a 'cheap' way to compensate for the emotional tension. Their inhibition is compensated due to the increase in tension of the mechanisms that regulate heart rhythm and reduce interconnections between the front and rear structures of the brain.

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