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ANALYSIS OF MODERN METHODS FOR ESTIMATING THE BRAIN LEVEL OF BRAIN TIRES OF OPERATORS OF EXTREME ACTIVITIES

The problem of fatigue is one of the most complex and multifaceted in the physiology and psychology of work, not only for operators of extreme activities (EMS) but also for ordinary workers. It has long been of interest to researchers in many fields of science. Theoretically, the importance of studying fatigue is due to the fact that it is an intermediate state between normal and pathology. The practical significance of such a study is determined by the impact of employee fatigue on reduced productivity and quality of work, and social - with temporary disability and disability of those workers who perform work in conditions of overstrain of physiological systems.

The central-cortical concept of the development of brain fatigue was developed in the works of IP Pavlov, ME Vvedensky, OO Ukhtomsky, MI Vinogradov, PK Anokhin, SO Kosilov, VV Rosenblatt and others . She received her experimental confirmation, which boils down to the following conclusions:

1) Accumulation of lactic acid in the muscles is not the main cause of fatigue, and in the whole human body fatigue is not directly dependent on the accumulation of metabolites. The person gets tired and at performance of easy and mental work when there is no accumulation in muscles of lactic acid;

2) The main share in the mechanism of fatigue belongs not to peripheral but to central processes. This is evidenced by the extremely low fatigue of peripheral devices and the impact on the development of fatigue of the central nervous system (emotions, automatism);

3) The primary link of the central mechanism has a cortical nature. The lower the level of conscious control over the performance of work, ie the lower the level of excitation and, consequently, the energy expenditure of cortical centers at work, the less it is tiring, although the nature of muscular loads and efforts does not change;

4) An important role in the development of fatigue is played by the process of inhibition in the cortical center of the musculoskeletal system.

Shifts in the state of the cortical centers are due to many reasons. The main one is that the cortical centers, having the lowest level of efficiency, carry a large load associated with the processing of various information and regulation of all organs and systems of the body, namely:

- streams of afferent impulses in relation to the work task are directed to the cortex;
- the cortex generates impulses to contract muscles;
- from the working muscles come signals about the chemical changes that occur in them under the influence of the work performed;
- similar signals come from other organs and systems that ensure the performance of work (cardiovascular, endocrine, respiratory, etc.);
- part of the information is in the form of the results of mental activity of the brain (memory, imagination, thinking, etc.);

- a huge flow of excitement comes from the reticular formation, which maintains the desired tone of the cortex.

The urgency of the problem is that fatigue gradually increases due to intense physical or mental activity, forcing the body to reach the limit of pathological state, disrupting the state of homeostasis of operators of extreme activities. Violation of homeostasis in turn leads to fatigue, chronic fatigue syndrome, overtraining syndrome and immune dysfunction.

After analyzing the literature, the Department of Biocybernetics and Aerospace Medicine NAU (Kyiv) hypothesized that brain fatigue (Fig. 1) - a complex process that reduces the lability of the nervous system due to energy costs and process development inhibition of neural networks, and reflects the inability of the body to maintain homeostasis, regulatory, autonomic and executive systems, the development of fatigue, a temporary decrease in efficiency.

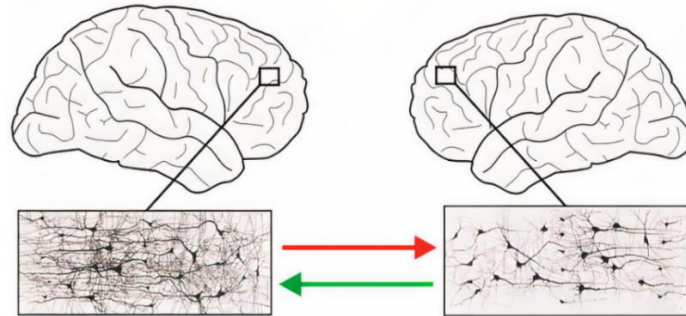


Fig. 1 - Brain fatigue at the physiological level is manifested by inhibition of brain cells -red arrow. A green arrow indicates the recovery of brain fatigue.

Consider brain fatigue as a process of temporary reduction of the body's functional capabilities, which to some extent are reflected in the psychophysiological state of EVD operators. Brain fatigue can be divided into two types of acute fatigue and chronic fatigue. Acute brain fatigue develops very quickly and intensively with unbearable and monotonous work, static and sensory combined or sensory-saturated activity in extreme conditions. Causes rapidly increasing functional changes in the central nervous activity. Chronic brain fatigue develops with the accumulation of adverse conditions, accompanied by decreased performance. In this case, the body is more susceptible to the disease.

Given the above, it should be noted that currently the study of fatigue, in fact, is just beginning. Most methods for assessing cerebral cortex fatigue focus either on special equipment that can assess the dynamic characteristics of the psyche (reaction, concentration, etc.), or on a set of psychological tests that characterize the current subjective characteristics of the psyche (level of experience, stress, motivation) operator. The use of electroencephalography, as a tool for assessing the professional suitability of operators of extreme activities, is based on outdated methods of quantitative and qualitative signal processing, which do not take into account the functioning of the information and energy field. However, the use of spectral methods of EEG processing can be used for in-depth study of information on changes in the psychophysiological organism of operators.

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