

FEATURES OF THE INFLUENCE OF THE INITIAL FUNCTIONAL STATE OF THE BRAIN ON THE MENTAL CAPACITY OF STUDENTS IN THE CONTEXT OF THEIR INDIVIDUALLY-TYOLOGICAL FEATURES

Yatsenko M. V.

Altay State University, Barnaul, Russia

E-mail: e.yatsenko@mail.ru

Education in the university is a category of mental labor, which is characterized by high neuropsychic tension and a prolonged psychoemotional load associated with learning.

The student is simultaneously influenced by a complex of external factors (natural and social), the integral result of which is the reaction of the organism or as an adaptation process (optimal functional state of the organism and high performance), or as disadaptation (tension and exhaustion of body systems and low efficiency of mental activity).

Mental efficiency is the ability of a person to perform any activity for a certain time without reducing its effectiveness and worsening the functional state of a person.

Features of the functional state of a person and his working capacity under the influence of external factors depend on many factors, among which an important role is played by the individual-typological features of man.

Thus, an assessment of the correspondence of a functional state to its optimum should be carried out taking into account the individual-typological properties of a person.

It can be assumed that the study of the bioelectric activity of the brain will allow to determine the role of individual characteristics in providing the initial functional state and mental performance of students.

In connection with the foregoing, the aim of the work was to study the individual characteristics of the effect of the initial bioelectrical activity of the brain on the effectiveness of mental activity.

The study involved 183 students, girls aged 19–22 years. Evaluation of mental performance with the help of letter tables Bourdon-Anfimov. The indicators were calculated: the volume of processed information, the speed of processing information and accuracy. Determination of the level of extra-introsia and neurotism by test G. Eysenck. Evaluation of the properties of the nervous system according to the test of J. Streliau. The strength of the excitation process, the strength of the inhibition process, the mobility of the nervous processes, the balance of the nervous processes were determined. EEG registration using Encephalan 131-03 device modification 10 (Medikom, Russia) from 21 channels. The equations of regression were calculated. Regression analysis of the following relationships was carried out: between indicators of mental performance and individual-typological features; between indicators of mental performance and EEG characteristics of the initial bioelectrical activity of the brain; between individual and typological features and the initial functional state of the brain.

A comparison of the three groups of regression equations led to the following conclusions:

- quantitative (volume and speed) and qualitative (accuracy) indicators of mental performance were determined by different characteristics of individuality;
- the investigated indices of individuality were associated with different characteristics of the bioelectric activity of the brain; the functional state of the brain depended more on individual features, ensuring a good accuracy of work;
- the stronger the thalamic effects on the functional state of the brain and the weaker from other nerve centers, the higher the volume and speed of mental performance, and the stronger the influence of the hippocampus on the activation of the cortex, the higher the accuracy of the work.

Keywords: mental capacity, functional status, the rhythms of the electroencephalogram.

References

1. Zashikhina V. V., Tsyganok T. V. Psychophysiological aspects of adaptation of university students // *Fundamental research*, 2, 64 (2014).
2. *Ontogenesis. Adaptation, Health. Education. Book III. Adaptation and health of students: teaching aid*, Resp. Ed. E. M. Kazin, 627 (Kemerovo: publishing house of KRIPKIPRO, 2011).
3. Bebinov S. E., Salnikov V. A. Correlation functions of attention with typological features of manifestations of properties of the nervous system of students of driving schools, *News VPSU*, 1, 1, 177 (2009)
4. Litvinova N. A. *The role of individual psychophysiological characteristics of students in adaptation to mental and muscular activity*, 168 (Kemerovo: publishing house of Kemerovo state University, 2012).
5. Revenko E. M., Salnikov V. A. The level of mental abilities of students, which differ in typological features of manifestations of properties of the nervous system, *Psychological science and education*, 2, 43 (2008).
6. Yadrishenskaya T. V. Correlation relations and gender features attention, *Scientific notes of ZabSU*, 1 (60), 155 (2015).
7. Danilova N. N. *Psychophysiological diagnostics of functional States*, 192 (Moscow: Moscow state University publishing House, 1992).
8. Aidarkin K. E., Fomina A. S. Study of the dynamics of spatial synchronization of brain potentials in solving complex math examples, *Valeology*, 3, 91 (2012).

9. Leonova A. B., Kuznetsova A. S. *Functional status and working capacity of the person in professional activity*, Psychology of labor, engineering psychology and ergonomics, edited by E. A. Klimov and others, 618 (M.: Yurait, 2015).
10. Moretti D. V., Miniussi C., Frisoni G. B., Geroldi C., Zanetti O., Binetti G., Rossini P. M. Hippocampal atrophy and EEG markers in subjects with mild cognitive impairment, *Clin. Neurophysiol.*, **118**, 12, 2716 (2007).
11. Thatcher R. W., North D. M., Biver C. J. Intelligence and EEG phase reset: a two compartmental model of phase shift and lock, *Neuroimage*, **42**, 4, 1639 (2008).
12. Volf N. V., Razumnikova O. M., Tarasova I. V. EEG-mapping study of sex differences during verbal creative thinking, *Focus on Brain Research.*, 123 (2007).
13. Vorobyeva E. V., Kharitonova I. J. Genotype-environmental determinants of power rhythmic components of the EEG during verbal-associative activity, *New research*, **1**, 23, 5 (2010).
14. Ivashchenko O. I., Berus A. V., Zhuravlev A. B., Mamlin V. Individual-typological peculiarities of basic personality traits in normal and EEG-correlates, *Human physiology*, **25**, 2, 46 (1999).
15. Sviderskaya N. E., Antonov A. G. Influence of individual psychological characteristics on the spatial organization of the EEG in non-verbal divergent thinking, *Human Physiology*, **34**, 5, 34 (2008).
16. Stoletniy A. S. The influence of individual personality traits on the effectiveness of the random BOS-regulation of beta-2 EEG rhythm, *Modern researches of social problems (electronic scientific journal)*, **7** (63), 167 (2006).
17. Fink A., Grabner R. H., Benedek M., Neubauer A. C. Divergent thinking training is related to frontal electroencephalogram alpha synchronization, *Eur. J. Neurosci*, **23**, 8, 2241 (2006).
18. Kaygorodova N. Z., Yatsenko M. V. EEG-correlates of mental performance in the context of individual-typological characteristics of students, *Psychology of education*, **7**, 15 (2012)
19. Stolyarenko L. D. Basic of psychology, 736 (Rostov-on-don: Feniks, 1996).
20. Golubeva E. A. *Individual characteristics of human memory (physiological study)*, 152 (M.: Pedagogy, 1980).
21. Strelau J. *The role of temperament in mental development*, 232 (M.: Progress, 1982).
22. Berdnikov D. V. *Psychophysiological peculiarities of regulation of activities focused on perception and reproduction of information*: Diss. ... doctor. med. Sciences, 378 (Kursk, 2016).
23. Bushov Y. V., Svetlik M. V., Krutenkova E. P. Correlation of intellect and accuracy of time perception with high frequency electrical activity in the brain, *Vestn. TSPU*, **2** (80), 91 (2009).
24. Volf N. V., Tarasova I. V. Relationship of oscillations at frequencies in the theta and beta rhythms of the EEG with the effectiveness of creative activity, *Human Physiology*, **36**, 2, 15 (2010)
25. Korobeinikova I. I. The success of the productive activities of students with different spectral and spatial characteristics of the alpha rhythm of the EEG background, *Akadem. journ. West. Siberians*, **10**, 3 (52), 62 (2014).
26. Koshelev D. A., Machinskaya R. I. Functional interaction of cortical zones in the strategy development process cognitive activities. Analysis of the coherence of the EEG theta rhythm, *Physiology of man*, **36**, 6, 55 (2010).
27. Hanslmayr S., Staudigl T. How brain oscillations form memories – a processing based perspective on oscillatory subsequent memory effects, *Neuroimage*, **85**, 648 (2014).
28. Klimesch W. Alpha-band oscillations, attention, and controlled access to stored information, *Trends in cognitive sciences*, **16**(12), 606 (2012).
29. Konareva I. N. Correlations between the psychological peculiarities of an individual and the efficacy of a single neurofeedback session (by the EEG characteristics), *Neurophysiology*, **38**, 3, 201 (2006).
30. Knyazev G. G. Oscillations of the brain and behavior: an evolutionary approach, Methodological problems of modern psychology: illusions and reality. *The materials of the Siberian psychological forum September 16-18, 2004*, 570 (Tomsk: Publishing house of TSU, 2004).
31. Gusel'nikov V. I. *Electrophysiology of the brain*, 423 (M.: Higher school, 1976).
32. Rilk A. J., Soekadar S. R., Sauseng P., Plewnia C. Alpha coherence predicts accuracy during a visuomotor tracking task, *Neuropsychologia*, **49**(13), 3704 (2011).
33. Bazanova O. M. Modern interpretation of alpha activity of the EEG, *International neurological journal*, **8**, 96 (2011).