THE IMPORTANT SIGNIFICANCE OF ELECTROENCEPHALOGRAPHY IN THE STUDY OF BRAIN ACTIVITY

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Annotation. This article describes the main goal of the project aimed at improving the activities of psychologists in Uzbekistan, as well as the inclusion of the subject "psychophysiology" in the curriculum and its significant role in the practical activities of psychologists. The article shows the advantages of teaching psychophysiology as a basic subject in the training of psychologists in prestigious educational institutions on the example of other countries.

Keywords: method, physiology, psychophysiology, electro-encephalography, activity, brain, structure, object, nerve, neuron, cell, mechanism, psychology, pedagogy.

In recent years, a number of activities related to the training of pedagogic personnel in the field of psychology and supporting the activities of practicing psychologists have been carried out in the country. Currently, 2,503 pedagogues and psychologists are working in the preschool education system, and 14,272 in the public education system.

5,717 students are studying "Psychology" in 10 higher educational institutions of the republic, "Pedagogy and psychology" in 19 higher educational institutions. Admission quotas in this field have been increased dramatically, in particular, 2,665 students were admitted in the 2018/2019 academic year.

Since 2017, the system of working with young people in educational institutions of preventive inspectors and public representatives has been established, preventive inspectors have been established in 5,696 general secondary educational institutions, and rooms of neighborhood representatives have been established in 5,328 general secondary educational institutions. This indicates that practical psychology is rapidly developing in the environment of Uzbekistan[1].

Research psychologists in higher educational institutions and scientific research institutes conduct research based on psychophysiological indicators in conducting scientific research. One of the important goals of psychologists is to study

psychological theories from a physiological point of view, to obtain reliable results, and to compare and contrast them.

Psychophysiological processes are hidden from external observations in an apparently certain order. For this reason, they have not been the focus of psychologists' attention for a long time, mainly in studies where it is possible to directly observe the emergence of human behavior. If psychologists had not shown great interest in the neurophysiological processes of the being they were studying, they would not have understood that many models of human mental activity are based on the same observation, and psychologists' work is "unfounded" (V.B. Shvyrkov)[2].

On the other hand, in neurophysiology there is always a demand to express the states of organization of physiological processes through psychological views and terms defined in psychological theories. These two sciences mutually enrich each other through various research methods and theoretical ideas about man. Therefore, the question arises as to what the study of the physiological indicators of the nervous system gives. First, physiological indicators are becoming reliable evidence in describing the studied behavior. Second, they allow researchers to directly covertly observe the activity of the organism underlying the behavior of their research. At the same time, the complete description of the mental process is based on the physiological indicators, the relentless efforts of many psychologists to explain the psychological phenomena about the organic state [3].

Electrophysiological methods are the main methods of recording physiological processes in psychophysiology. Electric forces play a special role in the physiological activity of skin tissue organs. Electric forces reflect all the main vital processes observed in nerve and muscle tissues, which include the physical-chemical consequences of metabolism, and therefore they are extremely reliable and accurate indicators of any physiological process.

Currently, the electroencephalography method is widely used in examination to obtain extensive information about the whole system activity of the human brain. This method is based on a collection of recordings from the top of the scalp, which examines the electrical activity of neurons in the brain. The electroencephalogram consists of complex, curved multi-frequency components.

Figure 1. - Electroencephalogram of an adult

The electroencephalogram (EEG) method is widely used for 2 different purposes:
1. In science – EEG is one of the most common methods for processing and analyzing the human brain using modern mathematical methods. EEG provides an opportunity to see various events with a quantitative and qualitative aspect of the functional analysis of the brain, and the reactions in the movement and the scratching feature.
2. In clinical practice - EEG is used to diagnose a number of neurological and mental diseases, primarily epilepsy. There are a number of characteristic changes in the EEG that are specific to the disease, and these data provide clues to the diagnosis of disease symptoms and specific methods of treating patients[4].
There are many questions about what is the nature of the recorded electrical activity (activity). This question began to interest researchers after the discovery of the biological potential of the brain by Hans Berger in 1925. Initially, scientists suggested that the complex electrical activity recorded on the surface of the brain is similar to biological electrical processes in peripheral nerves. That is, EEG was considered the accumulated action force of individual neurons. Later, the researchers

concluded that long-lasting natural signals are detected in the electrical activity of the brain.

EEG waves are now considered to be the result of the accumulation of postsynaptic forces. SCQK (post-synaptic excitatory force) and SKTK (post-synaptic inhibitory force). The electrical activity of glial cells also contributes.

However, the question of the nature of EEG has not been fully resolved to date and is of great scientific interest [5].

A decrease in potential vibration amplitudes without changing the frequency effect is called rhythm depression. Rhythm refers to the process of forming and increasing the amplitude of activity, which is regularly broken, and the synchronization of orderly changes. Dissynchronization of the flow of EEG wave processes by changing the movement of synchronized waves with low-order oscillations at different frequencies and less amplitude is called desynchronization [6].

There are usually several main EEG rhythms: delta rhythm, theta rhythm, alpha rhythm, beta rhythm, and gamma rhythm [7].

Delta rhythm. Introduces a delta rhythm wave in the frequency range of 0.5-0.3 Hz. EEG in a healthy adult in walking-standing position, the amplitude of the delta rhythm is very small and does not exceed 40 μV (normally 20 μV). delta - rhythm is the main rhythm of slow-wave sleep, its amplitude is 300 μV and more.

Theta rhythm. According to the results of different studies, the boundaries of the theta rhythm differ from each other, but on average, frequency oscillations from 4 to 8 belong to this rhythm. Normally it does not exceed 40 μV. The amplitude of the waves in the rhythm can reflect certain functional states associated with a decrease in brain activity or, conversely, concentration. An increase in theta index, on the one hand, indicates pathology, on the other hand, it indicates a decrease in brain activity or, on the contrary, concentration, cognitive and emotional activity.

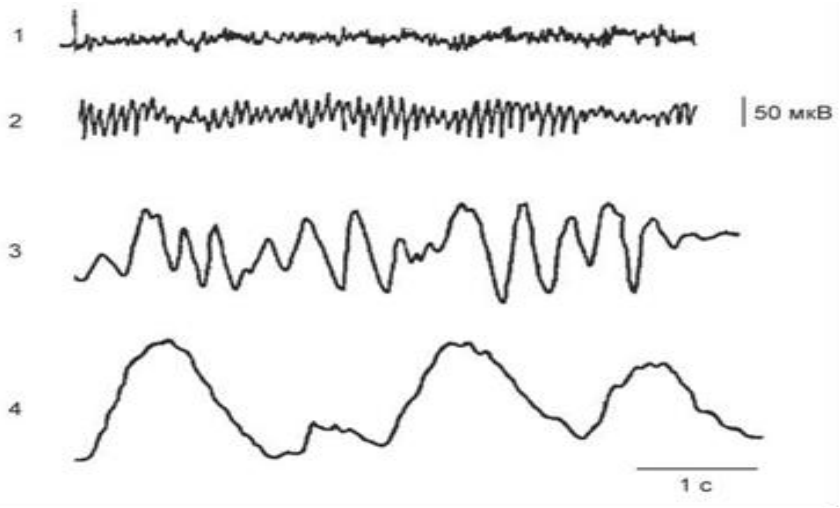
Alpha rhythm. It has a well-modulated (average amplitude of 60-80 μV) rhythmic activity with a frequency of 7.5 Hz to 13 Hz. It is noted in more than 85% of healthy adults. Alpha rhythm is clearly expressed in the top (central) and back (occipital) areas of the brain in a healthy adult, with eyes closed, awake, and at rest.

My rhythm. Sometimes it has an appearance corresponding to the alpha rhythm in terms of frequency. According to the shape of the character, mu-rhythm is also called arch-like. In contrast to the alpha rhythm, the mu rhythm is more visible in the pulse between the egates. Unlike the alpha rhythm, the mu-rhythm has a slow response when the eyes are open, and this rhythm depression is observed when performing

experimental movements (for example, making a fist). The mu-rhythm is evident in only 3% of people.

Beta rhythm. At a frequency of 14-35 Hz, it has an amplitude of up to 15 μV. It is better noted in the forehead and temple areas. Many authors associate synchronization and desynchronization of beta activity with various emotional and cognitive processes. Beta rhythm synchronization in the forehead area is associated with attention processes.

Gamma rhythm. Usually, the gamma rhythm range includes EEG frequency oscillations from 30 to 70 Hz (200 Hz and higher frequencies are also analyzed). High-frequency oscillation in the gamma range was discovered by E. Adrian in 1942. For some 10 years, these vibrations have been considered a catchy rhythm. However, it was later discovered that the gamma rhythm occurs in different situations in humans and animals. And it is related to such processes as the level of alertness, perception, attention, consciousness.



2- fig. The main rhythms of the electroencephalogram are 1-beta rhythm; 2- alpha rhythm; 3- theta rhythm; 4- delta rhythm.

Modern science uses various methods of EEG computer analysis. The most widely used method is spectral analysis, which allows for the mathematical separation and study of the frequency characteristics of the EEG. In this, they use Fourier's fast conversion of a signal source based on a sinusoidal sum of different frequencies and amplitudes. The results graphically reflect the frequency of the bands corresponding to the peak of the high amplitudes (for each channel of the EEG). Thus, spectral analysis allows to measure the amplitude or strength of the studied frequency range and to compare the accuracy of EEG rhythms in different directions. Based on

spectral analysis data, it is possible to create topographical maps of clearly visible frequency bands. This significantly improves the visibility of the obtained data[8].

In addition, methods of EEG analysis, uniform (synchronous) and non-uniform (desynchronous) evaluation methods of EEG associated with events, three-dimensional localization (restricted) method are used to determine electrical conductivity of the brain.

EEG is recorded with the help of electrodes mounted on the surface of the scalp, which amplifies the biopotential of the electroencephalograph.

Electrodes placed on the skin should have a low transient resistance (no more than 3-5 kOhm), a small degree of polarization and high resistance to corrosion. Electrodes coated with silver chloride are often used. A special helmet-set or a set of electrodes installed on a ready-made helmet is used to install the electrodes.

Currently, there are 2 different methods of EEG recording, they are monopolar and bipolar. In biopolar recording, the potential difference is measured between two electrically active parts of the brain (both electrodes are located on the scalp). In monopolar recording, the potential difference is recorded between electrically active and electrically neutral points (ear soft spot, bridge of the nose).

Conductive electrodes can be placed at various points on the scalp, taking into account the projection. Currently, the widely accepted international system of electrode placement is 10-20% and 10-10%. This system allows you to create a coordinate network by placing an electrode on the nodes representing the alphanumeric symbol. The marks on the forehead are marked with the letters F- (frontalis), the marks on the central part are S- (sentralis), the top of the head is P- (parietalis), the marks on the temple are T- (temporalis) and the marks on the back are marked with the letters O- (occipitalis)[9].

During recording, the EEG signal can be affected by external interference and is called an artifact. Artifacts are divided into physiological and technical. Physiological artifacts include eye movements, muscle contractions, swallowing movements, cardiograms, etc. Technical artefacts include 50 Hz electromagnetic fields caused by the presence of electromagnetic fields created by electrical networks in the room, as well as network currents associated with wire shaking and weak electrodes. All technical artifacts are usually easily eliminated[10].

Thus, the psychophysiological electroencephalogram program allows psychologists to fully understand their emotional states when conducting correctional work with their clients, and the electroencephalogram is a convenient and reliable

psychophysiological method for controlling the rhythms of the client's brain activity. In addition, it is the most modern and convenient method for the analysis of scientific works, reliable, new ideas for applied psychologists, psychophysiologists and psychologists working in other areas in the conduct of various studies on the study of brain activity.

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