while between Groups 2 and 4 the differences were non-significant.

Comparative analysis of changes in the omega-potential after both ascent and descent, caused by a single sound signal and monitored during 7 min showed that the nature of responses did not change. But absolute omega-potential values remain considerably higher throughout the 7 minutes in Group 2 at 1750 m.

This tendency is less pronounced in subjects with a lesser duration of adaptation to the "pulsatile shift". We feel that the first 30 sec are the most informative phase of the omegogram in response to a signal functional load. Analysis of variance values in Group 3 at 750 m showed a more than 2,5-fold increase as compared to the other groups. At 1750 m variance values in Group 3 were minimal relative to the other groups.

The data obtained suggest that significantly higher omega-potential values reflect the price the body pays for the process of adaptation in the presence of an increased load on the functional systems of the body. Changes in the omega-potential in the different groups indicate that the body is under conditions of a "pulsatile shift", at least one year is required before a new psychophysiological level of adaptation begins to form. We feel that omega-potential measurements are the valuable tool in the assessment of the basal values of the psychophysiological states of the human body. Our studies enabled us to ascertain that there are no obvious aberrations in the ultra-slow activity of brain structures in people working on a "pulsatile shift" basis.

EVENT-RELATED BRAIN POTENTIALS: PHENOMENOLOGY AND INTERPRETATION IN TERMS OF DYNAMICS OF SUBJECTIVE EXPERIENCE

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It is reasonable to assume that general conceptions concerning brain processes underlying behavior determinate as the formulations of the main problems in the study of event-related brain potentials (ERPs) as the way of solving the problems. Examination of basic tendencies in the ERPs study led us to an assumption that the study bases on a morpho-functional conception about brain activity in behavior. In general this conception postulates that behavior is provided by excitation of various brain structures realizing specific physiological and mental functions, their activities are manifested in ERPs. Thus, from this view point the main aim of the ERPs study is, using paradigm specific for realizing any mental function, to identify specific ERP and to determine point-to-point relations between ERP, realization of mental function and activity of brain structure – generator of ERP. Summing up the main results obtained in the ERPs study, we can conclude that in any paradigm, even strong purified, several ERPs developed at the same time can be identified; ERP of any type corresponds, from the one hand, to activation of the great number of brain structures and, on the other hand, to realization of great number of mental functions. Thus, neither the topology of ERPs (classes of ERPs and their relations) nor the relationships of certain type of ERPs with brain structure and mental function are defined. From our point of view this difficult situation in the ERPs study is a direct consequence of morpho-functional conception. The problem of manifestation of intimate processes underlying behavior in brain potentials might be solved on the basis of psychophysiological approach to behavior investigation developed in the Functional System Theory of P.K. Anokhin (Shvyrkov, 1985). In terms of this approach overt behavior may be regarded as a succession of behavioral acts. Realization of behavior based on an actualization of the elements of subjective experience (ESEs) formed on different stages of ontogenesis as integral behavioral acts in relation to goals of a subject, specific of motor activity and features of environment. Actualization of specific ESE correspond to retrieve from memory specific relationship between organism and environment but not to realization of any mental function. ESEs are represented by specialized neurons. The neuronal set's of different brain structures are specialized in relation to different but partly overlapping ESEs' sets. Any behavioral act realizes as a selection of a composition of ESEs connected with the result of the act and decreasing of actualization of ESEs of opponent sets. Then slow brain potentials can manifest the simultaneous actualization of different ESEs' sets and their mutual relations. The present study was undertaken to analyze in signal detection task the phenomenology of ERPs in connection with the dynamics of subjective experience in order to evaluate how the dynamics of ESEs and their relations manifests in parameters of brain potentials.

Methods

Ss (N=10) were instructed to wait for a warning click and then, having detected a flash, to press a button as quickly as possible. The flashes (50 ms duration) were presented on a screen in blocks of 4–7 (interval between individual flashes was 1,2 s) with intensity increasing from 10^{-6} to 10^{-2} nits. The flashes were preceded by a warning click at a random interval of 1–4 s. The EEG was recorded from F3, F4, Cz, P3, P4, 01, 02 referred to linked earlobes. The EOG, EMG of mm.thenar and mehanogram of button pressing were recorded too. The button was a force transducer and enables the recording of micropressings (from 30 g) as well as of pressing after the detected flash (about 3 kg).

Results and Discussion

Composition and dynamics of actualized ESEs were estimated on the basis of the task's performed (the present model could result in the following alternatives of detection: hits, false alarms and misses of signal) as well as of analysis of Ss' movements, which may be regarded as an manifestation of change of the compositions of ESEs in overt behavior. We have evaluated the distribution of onsets of micropressings (up to 300 g), saccadic eye movements (2–6°) during the observation interval and of button pressing after the detected flash. It was found two maxima in the distribution: in interval of 120–280 ms after the click and in interval of 310–472 ms after the detected flash. It can be inferred that the time intervals of the most constant changes of movements correspond to the changes of ESEs' compositions underlying the following successive behavioral acts: "waiting for a click", "observation" and "report". The analysis of unit activity in rabbit performing the signal detection task (Aleksandrov and Maksimova, 1987) revealed that in course of observation interval the selection of ESEs' set resulted in hit and decreasing of actualization of ESEs' sets resulted in other alternatives of detection. Notable minimum of the number of onsets of micropressings and saccadic eye movements just before the detected flash indicates that the ESEs' composition in this interval is in strong correspondence with hit. That is, the ESEs' composition is the most specific in relation to result of hit and highly constant during recurrent realization of hit. Within our model it could be identified by traditional means (according to waveform, latency, amplitude and topography) several ERPs: auditory and visual EP, movement-related potentials. λ-complex, CNV, P300, detection negativity and others. Correlation of the ERPs with the succession of acts demonstrated that ERPs, traditionally considered as specific phenomena connected with specific events in overt behavior, are fragments (or variants of averagings) of a complex united potential accompanied realization and change of successive acts. Its main elements are high amplitude positively in interval of acts' change and slow negative deflection corresponded to act realization with maximal amplitude near the detected flash. Slow negative deflection can be divided into some components according with low amplitude positivities connected with the onsets of micropressings and saccadic eye movements and corresponding to the changes of ESEs' subsets in frame of whole set realizing the "observation" act. In course of this act it was found the change of topography of united complex potential: at the beginning maximal amplitudes were registered in Cz, F3, F4, but at the end of act – in P3, P4, 01, 02. The data presented here and the similar results obtained in simple RT model and in tic-tac-toe (in game model we have quantitatively estimated the dynamics of actualized ESEs) (Maksimova, 1987) permitted us to advance hypotheses. ERPs are fragments (or variants of averagings) of a complex potential of uniform configuration corresponded to realization and change of integral behavioral acts. This united potential manifests the dynamics of specificity of ESEs' composition in relation to results of current behavior act, i.e. selection of ESEs realizing current behavior act and simultaneously decreasing of actualization of ESEs' sets related to alternative variants of behavior. The change of the specificity of ESEs' composition occurs by discrete consecutive stages in correspondence with components of united potential. Negative going shift manifests the increasing of specificity, positive going shift – the decreasing of specificity. Topography of united potential reflects the distribution over brain regions of ESEs' sets, differed by ontogenetic "age", which are actualized at consecutive stages of act.

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HUMAN PSYCHOEMOTIONAL RESISTIBILITY AND ITS ELECTROPHYSIOLOGICAL CORRELATES

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Human psychoemotional resistibility is determined by the retained ability of a person for self-regulation of his functional state, for adequate evaluation of the situation at hand, and for quickly making valid decisions under stress conditions. Presumably, this is one of the key factors providing for the efficiency of performance in many fields of labour activity and, in particular, with ergastic systems' operators, for successful performance of sportsmen at important competitions, etc. Yet, by far there has been no method for objective evaluation of this index, since the techniques used at present essentially boil down to determining the degree of the subject's emotional tension at the present moment.

All the above led us to an attempt to develop a method which could allow a quantitative assessment of psychoemotional resistibility. To this end, we studied the dynamics of EEG characteristics, event-related potentials, cardiac rate and galvanic skin response (GSR) while exposing the subjects to different sound tones in neutral and dangerous (the threat of painful electrical skin stimulation) situations.

The analysis of the data obtained showed that the degree of psychoemotional resistibility correlates with such variables as: 1. extinction rate of event-related GSR to neutral signals; 2. rate of elaborating differentiation between neutral and threatening signals; 3. extinction rate of event-related GSR to signals following the withdrawal of painful stimulation threat.

Besides, there has been found a correlation between the dynamics character of the indices mentioned and the reorganization pattern of the EEG frequency-and-amplitude spectrum following the removal of sound signals.

The studies carried out allowed to derive a formula for the quantitative evaluation of psychoemotional resistibility, which can be used for the purposes of professional selection.

ACTIVITY OF PERSONALITY, HEREDITY AND MOVEMENT-RELATED BRAIN POTENTIALS

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The great range of phenotypical variation of behavior traits of man is determined by the interaction between his genetic system and the environment in which he develops. Some researchers think that this traditional two factor model should be supplemented (in application to human being) with another factor – the activity of personality, which modulates the interaction of these two factors (Belyaev D.K., 1984). However the direct experimental evidence proving this point is actually absent.

The twin's method (25 pairs of monozygotic and 25 pairs of dizygotic twins) was used in investigation of the movement-related brain potentials (MRBP) evoked by the movement invariant in biomechanical scheme, but differing in the degree of volition and awareness, and also by its place in the integral functional structure of action.

All subjects took part in two experimental situations. In the first the subject had to push the button (I). In the second situation the subject had to predict the appearance of a stimulus: he was given a certain sequence of stimuli and each stimulus has the form of the single monotonic sound (500 Hz, 60 dB tone pip). The sounds were presented consequently to the right and the left ear. The sequence of stimuli allowed the subject to predict events with the probabilities $p=0,5$ (2) and $p=I,0$ (3). The subject had to guess the ear to which the