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HARDWARE AND SOFTWARE SYSTEM OF EVALUATION CRITERIA OF THE ADDITIONAL INFORMATION CNS

In the present paper discusses the application of existing approaches to evaluating additional information criterion function CNS of specialists extreme activities by creating hardware-software system, combining functional modules cephalography system, encephalography and heart rate variability.

Professional medical screening of specialists extreme activities (pilots, athletes) is essential for the prevention of possible diseases because the person can influence many extreme factors requires strong adaptive ability of functional systems. For example, despite the multi-level system of medical and biological selection of specialists extreme activities, supervision of physicians showed an increase in the incidence of headache, signs of sleepiness, discomfort from the heart, dizziness, a growing number of people with general weakness, signs of the emergence of depressive states and so on.

As part of the diversity of prepathological symptoms of specialists extreme activities predominate disorders of the central mechanisms of regulation. However, such a shift register using biomedical technologies and assess their degree is extremely difficult. Whereas, among the variety of existing hardware and software is difficult to single out a specific assessment that would be the level of its verbose met all the requirements imposed by this kind of research. Therefore, the problem of establishing additional criteria for the evaluation of functional reserves of central regulatory mechanisms through the creation of new biomedical technologies and in-depth analysis of the results is in order.

This work is a continuation of previous developments have shown the possibility of obtaining additional diagnostic information about the functional state of the central mechanisms regulating professionals adventure activities by switching to a modified examination techniques and special treatment outcomes cephalography system. [1,2]

The vertical position of the human body is supported by a complex reflex activity of the unconscious system analysis information by the central nervous system that has certain performance relationship reflex functions of biological rhythms brain function of the autonomic nervous system, other indicators of psychophysiological state. Therefore, a special system of biomedical of the CNS of specialists extreme activities to attract technology-based simultaneous information collection multilevel neural regulation and program-mathematical processing of data will enhance the level of inspection and collection of biomedical information.

Objective was to deepen biomedical research additional information criterion function CNS of specialists extreme activities by creating hardware-software

system, combining functional modules cephalography system, encephalography and heart rate variability.

To identify additional criteria evaluation functions of central regulatory mechanisms in humans examined 24 men (aged 25-45 years), which consists of four stages. The first stage of the survey process includes determining psychological indicators. Mental testing defined followed by the allocation of specialist extreme activity to one of sixteen personality classification categories taking into account the anthropometric parameters (age, sex, height, weight). [3]

Each classification category is characterized by a set of qualitative and quantitative parameters, which makes it easy to track any - changes during the next stages of the evaluation function of the central mechanisms of regulation. The second phase of the study - evaluating the electrical activity of the brain using electroencephalography with additional visual and audio stimuli. Third stage - evaluation of autonomic regulation by heart rate variability. The last stage involves research activities resulting figures denote the reflections that appear as vibrational dynamics of movement in the vertical position of the body by cephalography system.

The technique of constructing and operating the project biomedical hardware and software system for non-invasive in-depth study of the functional state of the CNS. The main attention is paid to the creation of a new modified method of studying human cognition reflexes by applying integrated video recording performance resulting work statokinetic functions - cephalography system. The use of optical tools for the construction cephalography system picture needs to be taken into consideration the following technical steps:

- Building a scene in external coordinates using the transformation model coordinates;
- The transition from external coordinates to the coordinates of observation;
- Coordinate Transformation observations in normalized coordinates;
- Display of normalized coordinates in the coordinates of the device. [4-9]

Completed pilot comprehensive survey specialists extreme activities. An array of biomedical information on the characteristics of changes of physiological parameters, biological rhythms brain, autonomic regulation and cephalography system of specialist extreme activity under the influence of extreme conditions.

In analyzing the results of the study subjects, except for classical and electroencephalography and heart rate variability, proved the most informative of the maximum amplitude deviation statokinetic functions chart and index cephalography system P_{kfg}, calculated according to the parameters of frequency amplitude deviations from the standards in the areas of conventional mapping cephalography system picture.

Such indicators to assess the function of the central regulation of cognition stability. Except as provided in prior studies, they have a close correlation with changes in certain physiological parameters, they can be used as an additional performance characteristics of emotional state.

Research specialist extreme activity showed the presence of significant differences in outcomes research cephalography system after prolonged exposure to stressors compared to the original data.

Growth cephalography system amplitude characteristics were found in separate survey and these changes always have the appropriate parallel with changes in the autonomic system regulation and physiological functions, objectify definition hidden features of individual dysfunction in the central mechanisms of regulation.

Conclusions

Thus, the results of research are obvious practical value in terms of additional objective assessment of physiological functions and dysfunctions occult central regulatory mechanisms that dictate the need for further research in this direction. In the future, opens the possibility of introducing advanced technology control the functional state of the central nervous system of specialist extreme activity during the immediate implementation of the production function.

References

1. Babiyak, V. I., Lantsov, A. A., Bazarov, V. G. (1996). Klinicheskaya vestibulologiya: Rukovodstvo dlya vrachey. St-Peterburg: Gippokrat, 336.
2. Kuzovik, V. D., Gamov, V. G., Onykiienko, Y. Y. (2010). Osoblivosti programnogo zabezpechennya eksperimentalnih doslidzhen bioob'ektu. *Inzheneriya programnogo zabezpechennya*, №2, 68–75.
3. Ivanec O.B., Bulygina O.V., Dvornik M.V., Onykiienko, Y. Y. (2010). Vykorystannja merezh Petri dlja topologichnogo modeljuvannja. *Elektronika ta systemy upravlinnja*, №2, 129–134.
4. Tsai, R. (1987). A versatile camera calibration technique for high-accuracy 3D machine vision metrology using off-the-shelf TV cameras and lenses. *IEEE Int. Journal Robotics and Automation, Vol. 3(4)*, 323-344.
5. Zhang, Z. (1998). Determining the epipolar geometry and its uncertainty: A review. *International Journal of Computer Vision, Vol. 27(2)*, 161-195.
6. Malek, S., Zenati-Henda, N., Belhocine, M., Benbelkacem, S. (2008). Calibration Method for an Augmented Reality System. *Proceedings of World Academy of Science: Engineering & Technology, Vol. 47*, 310-315.
7. Heikkila, J. (2000). Geometric Camera Calibration Using Circular Control Points. *IEEE Transactions on Pattern Analysis and Machine Intelligence, Vol. 22, No. 10*, 1066-1077.
8. Triggs, B., McLauchlan, P., Hartley, R., Fitzgibbon, A. (1999). Bundle Adjustment – A Modern Synthesis. *ICCV 99: Proceedings of the International Workshop on Vision Algorithms. Springer-Verlag*, 298-372.
9. Zhang, Z. (2000) A flexible new technique for camera calibration. *IEEE Trans. on PAMI, Vol. 22(11)*, 1330-1334.