

Perspectives on the Human Adaptation Potential

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Abstract. The paper presents the results of a content analysis of scientific publications that have identified the four main approaches to the study of adaptive potential in males living and working in the Tyumen region: anatomical and anthropological, interdisciplinary, chronobiological, and integrative. According to the results of an expert mathematical analysis of the data, the leading morphofunctional markers of human adaptive potential were identified: cholesterol, body mass index, signs of myocardial hypertrophy, and blood pressure. The low significance of behavioral risk factors in the implementation of maladaptive states in the study group is determined.

1. Introduction

The study of the process of human adaptation to environmental factors remains the most attractive and does not lose its relevance [1, 2]. The fundamental works of P. K. Anokhin, V. P. Kaznacheev, F. Z. Meerson, F. B. Berezin, B. M. Fedorov, N. A. Agadzhanian, L. E. Panin, G. N. Kryzhanovskiy, R. M. Baevskiy, and K. V. Sudakova, dedicated to the search for universal responses of the human body under extreme conditions for many years, determined the path of development of domestic physiology [3, 4]. Since the discovery of a general adaptation syndrome by Hans Selye and the syndrome of polar tension described by V. A. Kaznacheev, N. A. Agadzhanian, and V. I. Khasnulin, a large number of works have appeared. They detail the patterns of compensatory-adaptive reactions of the human body working and living in the territories with extreme climate [5].

For the syndrome of polar stress, the leading pathogenetic factor is oxidative stress, accompanied by northern tissue hypoxia and nonspecific changes in the cardiorespiratory system. Violations of neurohumoral regulation in conditions of oxygen deficiency are characterized by a wide range of metabolic disorders and depend on: age; sex; length of residence, and methods of organizing labor (permanent employment, shift, and shift-forwarding methods of organizing work, the effect of working voltage). The study of the adaptation of the new settlers of the 1st and 2nd generation is of particular interest to the researcher [6, 7, 11].

When assessing the human adaptive potential (HAP), one should take into account the fact that the main workload in the development of territories with an extreme climate lies with men. Here, we should pay special attention to the search for those HAP indicators that will play an important prognostic value in the development of a cascade of compensatory body reactions in response to the actions of an aggressive environment [8,9].

The purpose of the study is to develop a methodology for assessing the human adaptive potential (HAP) in young men and women of active working age.

2. Materials and Methods

In the course of the study, the following materials and research methods were used. The content analysis of scientific publications is dedicated to the study of the adaptive potential of men of active working age, living and working in the Tyumen region. An expert mathematical analysis of morphological (ECG), physiological parameters (SMAD, Holter monitoring, measurement of blood pressure) of the cardiovascular system, biochemical parameters (total cholesterol, glucose, CRP), anropometry, the results of clinical anamnestic

research, and psychodiagnostic testing were carried out to identify criteria for the importance of HAP indicators [10].

3. Results

The content analysis of scientific works of the Tyumen physiological and anthropological scientific schools identified four main areas of study of the adaptive potential of an adult.

1. The anatomical and anthropological approach to assessing the individual variability of residents of the Tyumen region is described in the fundamental works of N. F. Zhvavoi, P. G. Koinosov, S. A. Orlov, N. Ya. Prokopyev, O. G. Litovchenko, et al; T. V. Chiryatyeva & O.A. Dragich [11].
2. The interdisciplinary approach [6, 8, 13] is used to study the adaptation mechanisms of the cardiorespiratory system and morphofunctional features of the formation of individual resistance to submaximal loads in people of active working age using psychodiagnostic testing and sociological research methods (V. S. Solovyov, I. V. Medvedev, A. G. Naimushin, S. V. Solovyov, A. M. Durov, T. V. Bolotnova, I. M. Petrov, et al.).
3. The chronobiological approach [11, 13]. Desynchronization of modern man. The chronobiological and chronomedical aspects of the process of human adaptation to the harsh conditions of the Middle Ob (G. D. Gubin, D. G. Gubin, et al.).
4. The integrative approach [14, 15]. Conceptual physiological analysis of the assessment of the mechanisms of tooth decay and periodontal diseases (A. V. Bragin, V. V. Kolpakov, O. A. Kuman, L. M. Musina, G. I. Ron).

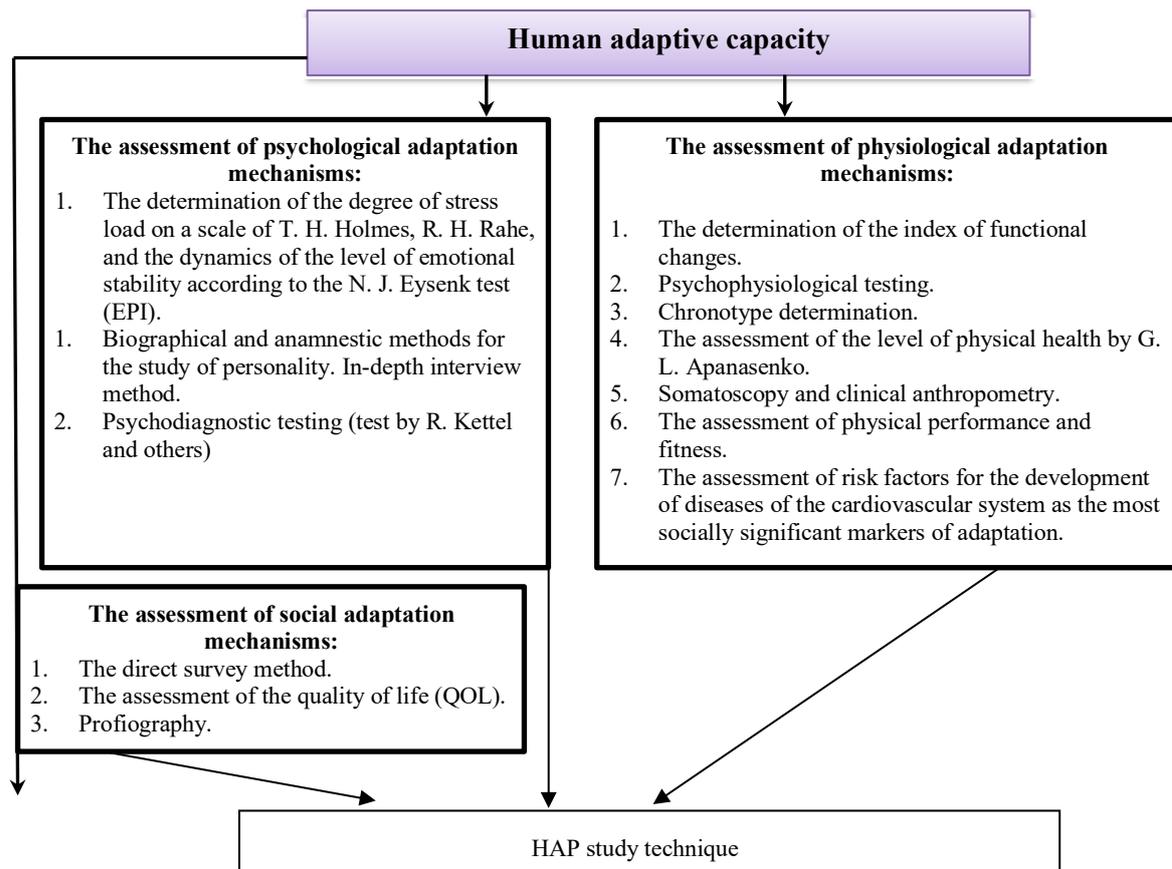


Fig. 1. The HAP study technique.

For an objective assessment of the tension of adaptation mechanisms, all research groups used indicators of the activity of the cardiovascular system and anthropometry. Fig. 1 shows a graphical model for assessing the human adaptive potential developed by us in the course of many years of research on compensatory-adaptive mechanisms of human environmental adaptation. A number of difficult points in the study of HAP

should be noted. The calculated IFI indicator was used by us as a traditional marker of the voltage of adaptation mechanisms. In assessing the function of external respiration, we encountered technical difficulties in standardizing spirometry indices.

With regard to indicators of nonspecific resistance of red and white blood, we have a large scatter of data. The study of the microbiome of the oral cavity is ongoing. Individual variability of morphotypes in comparison with various physical development options is relevant in the study of children and adolescents born in the North of the Tyumen region. For men of active working age and young men, clinical anthropometry with the determination of the component composition of the body is of great importance. Numerous parametric and nonparametric results of psychological and sociological testing need additional processing and are now undergoing a filtration procedure. Which indicators are reliable for creating a model of adaptive potential, and which we can ignore? Is the principle of redundancy of empirical data collection the best in a comprehensive assessment of human health, or can we ignore most of the measurements? In this situation, the use of statistical and mathematical support of analysis systems based on expert assessment allows us to determine significant factors.

When developing a mathematical model for assessing the significance of the components of adaptive potential, expert mathematicians twice analyzed and processed information on the questionnaire (randomly selected data of 151 men). As a result of the ranking of signs, significant factors were: indicators of total cholesterol, body mass index, left ventricular hypertrophy, and blood pressure level. Behavioral risk factors for the development of diseases of the cardiovascular system: smoking, changes in eating behavior, social status of the respondents, and the level of stress load, experts ignored [10]. The methodology for assessing adaptation potential includes the leading group of indicators (lipid profile, ECG, measurement of blood pressure, calculation of BMI); additional methods for determining AFT (questionnaire, advanced clinical diagnostic study).

4. Discussion

In the 2017 ACC guide, risk factors that significantly change the course of arterial hypertension are classified as: smoking, diabetes, hypercholesterolemia, overweight and obesity, inactivity, and unbalanced nutrition. The factors that are difficult to change are chronic kidney disease, obstructive apnea syndrome, low socioeconomic, and educational status. Age and involuntional changes, male gender, and heredity remain unmodulated risk factors for cardiovascular complications [16, 17]. The aggravating role of emotional stress in the development of pathology of the cardiovascular system according to the results of expert mathematical analysis for this group of men was absent. An apparent contradiction in this regard is caused by the statement of the Russian Cardiology Society (RCO) and the European Society of Cardiology ESC, chaired by Massimo F. Piepoli, that stress at work and with family worsen the prognosis of cardiovascular diseases. Chronic stress associated with high excess work and psychological conflicts are predictors of the early development of coronary heart disease in men. This hypothesis needs additional verification and long-term dynamic observation. In relation to emotional stress, we also do not have an unambiguous position. On the one hand, the correction of stress-induced conditions improves the quality of life of men, and, on the other, it does not have a significant effect on reducing the risk of complications of diseases of the cardiovascular system [18]. The revealed contradiction made it possible to formulate a hypothesis on the degree of importance of social and behavioral factors in the implementation of the health care of men and adolescents, which is in the stage of an emerging pedagogical experiment. At the moment, the database of the "Health Region" project is being processed, which would significantly complement the methodology we developed for assessing the adaptive potential of young men and women of active working age.

5. Conclusion

Considering the constructs of public health and the mechanisms of development of chronic noncommunicable diseases, we found a very disappointing fact about the absence of a tendency to a decrease in morbidity and mortality in CVD. Therefore, the prevention of chronic noncommunicable diseases in general, and conditions of the cardiovascular system, in particular, should consist of teaching people of active working age and adolescents the principles of self-assessment of health and the skills of calculating HAP. At the same time, the pedagogical program for the formation of competence for the health protection of youth should not have a one-sided focus on the rigid promotion of a healthy lifestyle. The students (regardless of the level of education and

age), master, first of all, the general culture of health, voluntarily or involuntarily accept the prevailing ideas and values, and only then proceeds to creative activity. In our opinion, the axiological orientation of the educational process should contribute to the transformation of people externally and internally. Therefore, it contributes to the harmonization of personality [19]. As it seems to us, the psychological-humanistic paradigm and the existential need for self-improvement and self-creation of an individual can be understood by a person when covering the attitude to the health potential that is given to each of us by birth.

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