

Adaptive Reactions of Students From the Position of Self-Actualization and Autonomic Status to the Intense Impact of Digitalization

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ABSTRACT

The article presents the results of studying the adaptability of students to the conditions of digitalization by analyzing the interrelationship between indicators of self-actualization and autonomic status. The study used a software-static complex "Varicard", which provides a record of heart rate variability in vivo. Studies have established that the control of adaptive reactions under conditions of intense mental stress using digital technologies carried out in boys by activating ULF, and in girls by VLF. The data obtained reflect the complex mechanism of adaptation of the body to the complex effects of external and internal factors. The results of the study allow us to state that the adaptability of the body of students during classes for 180 minutes using IT technologies achieved due to individual cross-adaptation and cross-resistance.

Keywords: *digitalization, adaptability, self-actualization, autonomic status*

1. INTRODUCTION

In recent years, the issue of various problems of introducing digitalization into the modern educational space actively discussed [1]. It connects with the achievements of scientific and technological progress in the field of information and communication technologies and robotics [2]. We can view this theme from different points of view. There is information in the literature on the study of the health of IT operators [3]. However, the adaptive reactions and health of students in the conditions of knowledge formation using IT technologies not been studied enough [4]. Also, the search for the necessary professional information is under the control of the educational organization [5].

Students' appeal to the search for the necessary knowledge using the digital space allows them to identify their common socio-cultural values [6]. In this case, the concept of "self-actualization" manifests itself as the highest need and significance on the vital path of a person. Theoretical and empirical studies show that self-actualizing personality distinguished by activity, self-respect, self-acceptance, autonomy, self-confidence, and creativity [7]. Social transformations increase the role of a person's responsible attitude to their self-development, including with the use of modern achievements in the field of IT technologies [8]. However, that prolonged stay at the computer limits physical activity and hypodynamia occurs [9]. What are the adaptive reactions of the human body while working in the digital space?

Adaptive responses exist considered as an individual adaptation of the body to changing environmental conditions [10]. In labour physiology, much attention paid to the state of excitation of the autonomic system. So it a reflection of the processes of adaptation to work [11]. The autonomic nervous system ensures health safety, protection of the body from external influences, including not only labour but also a mental activity. The autonomic status of a living system understood as a set of adaptive reactions of the autonomic nervous system to the effect of a complex of stress factors of various natures that ensure the viability of the organism [12]. There is no consensus on the concept of "autonomic status". From our point of view, this concept considered in the aspect of prerequisites for nosologies associated with the cardiovascular system [13].

The purpose of the research is to study adaptive reactions of students from the position of self-actualization and autonomic status to the intense impact of digitalization.

2. METHOD

The study used the following methods: a meta-analysis, observation, testing and experiment.

We used the technique of E. Shostrom modified by L.Ya. Gozman ("Test for determining the level of personality self-actualization" - SAT). This technique aimed at studying the self-actualization of the individual. In the analysis of the work, the following scales used value orientations, self-respect, synergy and creativity.

Among the modern promising methodological approaches to the study of adaptive reactions is heart rate variability. The autonomic status studied according to the indicators of the analysis of heart rate variability. Of specific interest is spectral analysis or analysis of slow hemodynamic fluctuations (PCA). Following the literature data, the frequency ranges have a specific physiological content: HF - vago-insular, and LF - sympathetic branch of the baroreceptive reflex; VLF - characterizes ergotropic processes. Our research established that the above HRV indicators are biological markers that affect human behaviour and adaptive responses [14].

The study used the software-statistical complex "Varicard" in the software "ISCIM6.0". The data obtained processed mathematically and statistically with the execution of drawings using the program "Statistica".

3. RESULTS AND DISCUSSION

Slow fluctuations in spectral characteristics can be indicators of structures in correlation with social factors that affect a person during the execution of operational tasks using IT technologies. Studies established that strong fluctuations could occur at bifurcation points, because of which the subsequent correlation enhanced.

Spectral analysis of heart rate showed a close interrelationship between HF and LF ($r = 0.83$; $P < 0.001$) in boys and girls ($r = 0.93$; $P < 0.001$) during the period of performing tasks using digital technologies for 180 minutes. In young men, the adaptive responses to mental stress carried out with the participation of low-frequency waves, and a relationship revealed between the spectra: HF and ULF ($r = 0.85$; $P < 0.001$), LF and ULF ($r = 0.69$; $P < 0.001$). It indicates the participation of ultra-low-frequency oscillations (ULF) in the regulation of the heart rate, which reflects the unfavourable situation of the enhanced adaptation process.

In girls, the influence of ultra-low-frequency waves in adaptive reactions on mental load was found between LF and VLF ($r = 0.61$; $P < 0.01$), LF and ULF ($r = 0.51$; $P < 0.001$). In this case, the dominance of ultra-low-frequency waves (VLF) in the control of the regulation of the heart rhythm observed, which is characteristic of defatigation. The data obtained indicate that the control of adaptive processes under conditions of intense mental stress using digital technologies carried out in boys by activating the ULF, and in girls by VLF. The data of our observation indicate a complex form of reflection of various influences of spectral components on the adaptive processes of the cardiorespiratory system in students with prolonged exposure to IT technologies in traditional learning conditions.

Correlation analysis revealed in boys and girls a reliability significance of the interrelationship between HF and self-esteem ($r = 0.48$; $P < 0.05$) and value orientations ($r = 0.54$; $P < 0.01$) (Figure 1-2).

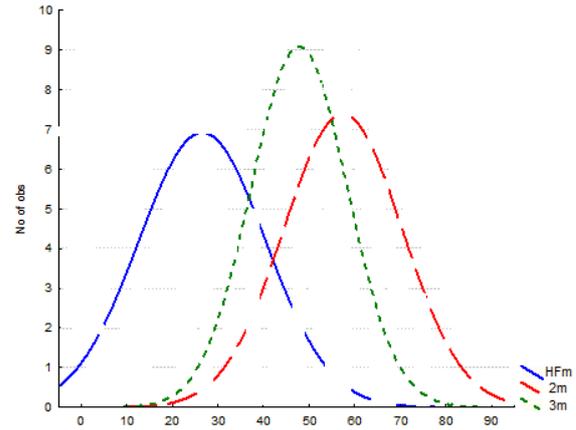


Figure 1 The relationship between self-esteem and HF indicators in boys (m) (during classes for 180 minutes using IT technologies)

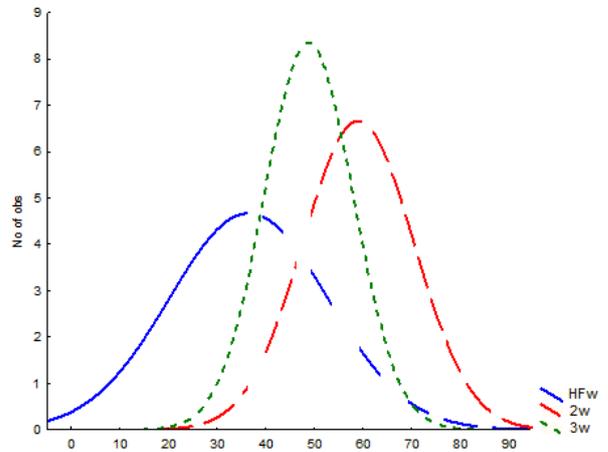


Figure 2 The interrelationship between self-esteem and HF indicators in girls (w) (during classes for 180 minutes using IT technologies)

For boys and girls during classes for 180 minutes using IT technologies, the synchronization of cognitive activity carried out by the high-frequency HF spectrum.

In boys and girls, a significant interrelationship revealed between the indicators of creativity and VLF ($r = -0.49$; $P < 0.05$) (Figure 3-4).

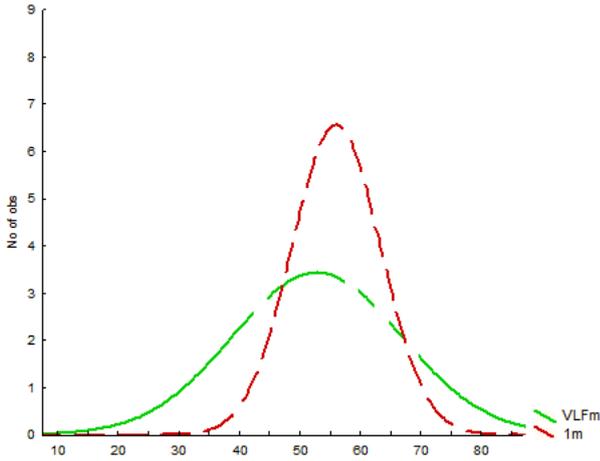


Figure 3 The interrelationship between the indicators of creativity and VLF in boys (m) (during classes for 180 minutes using IT technologies)

In young men, the processes of creativity and ergotropic reactions synchronized and have a significant variation in the adaptive process due to the VLF spectral harmonics (Figure 4).

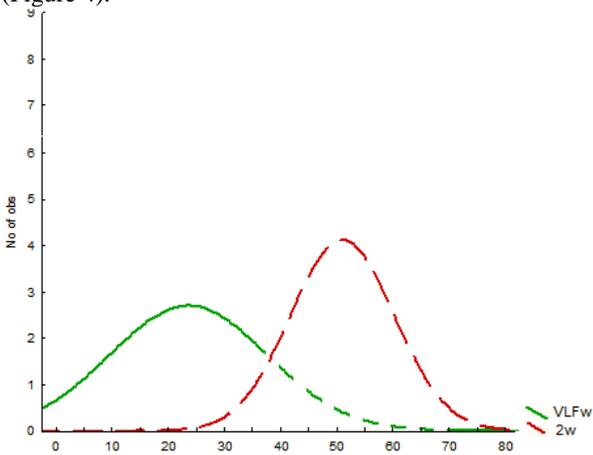


Figure 4 The interrelationship between the indicators of creativity and VLF in girls (w) (during classes for 180 minutes using IT technologies)

In girls, creativity and ergotropic reactions, as well as in boys synchronized, but depend on the individual characteristics of creativity. Therefore, girls are more likely to experience a depletion of adaptive responses during intense mental stress.

Among the indicators of self-actualization, the factor of synergy is of particular interest. The emergence in the science of the concept of "synergetics" as an interdisciplinary direction of scientific research, made it possible to look differently at the development of society, its value orientations in the conditions of intensively developing scientific and technological progress. Bifurcation is a concept that allows the scientific community to understand modern development trends, including

biological and psychological knowledge about a person and his activities. In our work, this concept is significant. A living system, possessing the ability to organize, exhibits instability under the influence of the conditions of novelty in which it finds itself, which allows it to adapt to the changed state of the external or internal environment.

The results of the correlation analysis showed that synergy in boys reliably determined by LF activity ($r = 0.48$; $P < 0.05$), and in girls - HF ($r = 0.45$; $P < 0.05$) (Figure 5-6).

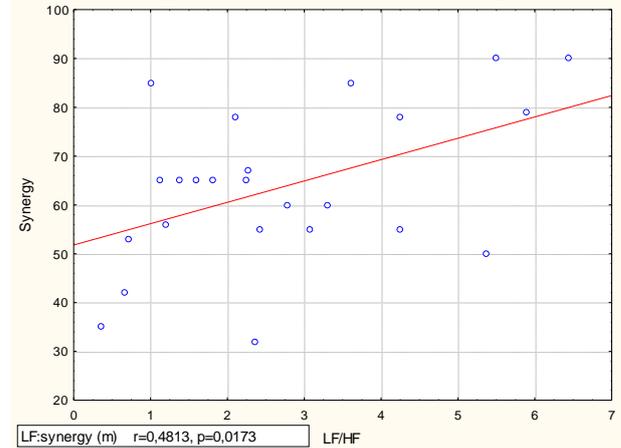


Figure 5 The interrelationship between LF indicators and synergy among boys (m) (during classes for 180 minutes using IT technologies)

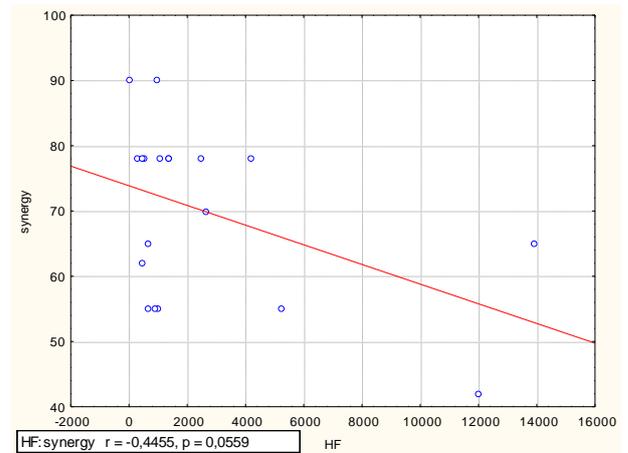


Figure 6 The interrelationship between HF indicators and synergy in girls (w) (during classes for 180 minutes using IT technologies)

We can state that the adaptive reactions of male and female students to long-term lessons using digital technologies carried out by the interaction of external and internal factors, due to which the occurrence of cross adaptation or cross-resistance is likely.

4. CONCLUSION

The results of the study showed that the control of adaptive reactions under conditions of intense mental stress using

digital technologies carried out in boys by activating the ULF, and in girls by VLF. The data obtained reflect the complex mechanism of adaptation of the body to the complex effects of external and internal factors. Internal factors are associated with physical inactivity and the peculiarities of the blood supply to the brain in conditions of intense mental stress. External factors are due to the development of digital competencies as a socially significant value that affects the self-actualization of the individual.

We assume that students under the conditions during classes for 180 minutes using IT technologies carry out adaptive

reactions according to a long-acting mechanism. The human body not adapted to the complex intensive impact of digital technologies, and therefore adaptability achieved through individual cross-adaptation and cross-resistance. The data obtained require additional studies with a larger sample.

It is necessary to develop sanitary and hygienic labour standards in the context of acquiring knowledge using modern digital technologies. We assume criticism regarding the conclusion. There is a lack of research on this issue.

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