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EDITORIAL

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IJSA

EDITORIAL

How will Blockchain Technology Change Education Future?!

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The question "how" and "what to learn?" has always been urgent. New methodological approaches to education are appearing, pedagogical technologies are being worked out, innovative forms and methods of education are being implemented. The modern society being plunged into the information age, has not noticed that information technologies have started playing a more significant role in the educational process. A blockchain technology deserves a special attention nowadays. It appeared ten years ago and started its way as an undermining innovative technology that is moving upwards changing the old-fashioned forms. Having a great potential it has already started transforming financial and economic spheres, now it is turn for the sphere of education.

The aim of the study: to turn the attention of scientific and pedagogical workers to possibilities of using the blockchain technology in the sphere of education, as well as characterise the peculiarities of its implementation.

For the last century didactics has accumulated a rich experience, still some drawbacks of the educational process have become more evident. Among them are the following:

- the amount of information that a person has to perceive is increasing practically every day;
- the period of studying at school, universities and courses of professional skills improvement is becoming longer;
- not everything being taught at educational institutions will be proved useful in life and professional activity.

Under such circumstances the mass education is becoming less and less effective.

The education directed at mastering information and its reproductive output is unable to develop skills properly and take into account the interests of those who study. These banal (as it may seem for the first time) and known for everyone problems of education are almost impossible to overcome.

Still the information age itself proposes a way out of this exclusive circle.

Firstly, the paradigm of learning is being changed from "Education for the whole life" to "Life-long education". Secondly, the blockchain technology has appeared (2008).

Blockchain is a technology of distributed data register, that keeps an orderly chain of blocks which is constantly increasing. Each chain has a temporary indicator, a hash

from the previous block and transaction data, which can be added by other data while the existing data cannot be deleted. It looks like a hash-tree. Enciphering (cryptography) allows protecting these data from falsification and misrepresentation.

Let us consider some characteristic features which are peculiar for the blockchain technology and can be implemented into the educational sphere that in our opinion corresponds to the modern demands and thus will favour the transition of education to a new, higher, qualitative level.

In the process of education:

- digital identifications are used;
- the whole education chain of those who study is systematised (school – university – production);
- all acts are realised in the consecutive order and agreed upon;
- the freedom of choice as for the goal, content, forms and methods of studying is considered;
- there is a possibility to choose a teacher/lecturer and the appropriate time for studying.

Those who study are:

- ready to perceive the curriculum;
- motivated and active;
- able to carry out the schedule of hours;
- capable of putting the obtained knowledge into practice;
- successful in studying and life activity.

To our mind, the task of a teacher who uses the blockchain technology in the educational process is to create a common system of knowledge, skills and habits that will provide the personality with a set of competencies for successful and happy living.

So, the life is not static, but its changes have never been so swift as nowadays; information technologies have never been implemented so fast into various spheres of a person's life activity. For example, social distance by the pandemic CoVid-19 has resulted in rapid widespread of distance learning methods. We are sure that the nearest future will surprise us more than once, shake our stereotypes, destroy common models and change standards.

The blockchain technology gradually but confidently is becoming recognisable in various spheres, and the educational one will not be an exception.

Thus the increase in quality of the educational process through implementation of the modern technologies becomes a strategic task which is worked out by the policy in the educational sphere of the whole world. The blockchain technology has a huge potential not only for the economic sphere where it has started to be used actively, but for the educational one as well, whose meaning has not been realised by the society yet.

Application of the blockchin technology in the educational sphere will combine organically the methodology of the personality-oriented and student-centred approaches. We have no doubt that that there is a question of time as for implementing the blockchain technology in the sphere of education. This is a modern technology that will help a person's nature and make the educational process easy, useful and interesting.

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Education

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ORIGINAL RESEARCH

Motivational Aspects and Modern Innovative Technologies in the Formation of Professional Competencies of Future Specialists in Higher Medical Educational Institutions

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Authors' Contribution:
A – Study design;
B – Data collection;
C – Statistical analysis;
D – Data interpretation;
E – Manuscript preparation;
F – Literature search;
G – Funds collection

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Abstract

Background and Aim of Study: *During the research the improvement ideas of the educational system were analysed. Accented attention on an advantages of the distance education, and also his roles and place in the system of higher education. As the demand to the quality of the students' knowledge has become the main criterion in employment. According to the new educational standards at the grant of educational services it is necessary to be oriented on the professional qualities of the future activity of the graduate.*
The aim of the study: to represent the results of theoretical analysis and empirical study of the formation of oriented educational-scientific information-computer environment on the basis of the Department of Microbiology of Danylo Halytsky Lviv National Medical University.

Material and Methods: *Modern methods of scientific research used in process: an analysis of the systems, biblio-semantic, statistical, empirical observations and information processing of oriented educational information and computer environment in the process of students' educational and scientific activity.*

Results: *According to the analysis of the obtained results, the key features of the motivational complex of students of higher educational institution was identified. The ways of organization of control and an analysis of students' success by means of information and computer technologies according to the state standards of higher education. It is offered, new approaches to forming of content of educational discipline.*

Conclusions: *The innovative tools and interactive applications on the basis of ICT will increase the possibilities of studying the discipline of microbiology, virology and immunology in higher medical institutions. What is appropriate in the context of integration of the new strategy of education.*

Keywords: *computer and information technology, distance learning, computer training, video conferencing, asynchronous e-zine, open virtual universities, healthcare system*

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Introduction

The reforms taking place in Ukraine in the medical and social spheres are aimed at forming a competitively oriented medical market economy, providing the last sustainable development dynamics. The medical organizations have to act in a competitive environment, to find and expand their niche in the market of goods and services, to master a new type of economic behavior, to constantly confirm their own competitiveness. In turn, this requires an increase the contribution of each health care professional to the achievement goals of their enterprise.

Therefore, a modern university that trains of the health care professionals in accordance to the changing market conditions should improve the education system, focusing on the quality and accessibility of educational services, as this has become the main criterion in employment. According to new educational standards at the grant of educational services it is necessary to be oriented on the professional criteria of future graduating student. The most important means of ensuring the quality of professional training of a medical student are an open educational resources (OER), consisting of educational and scientific platforms, which are available freely or with special access. The open educational resources include: educational courses, separate materials or modules of courses, manuals, videos of lecture, educational video, simulation centers, software and other tools, materials or technologies. For example, practical classes at the Department of Microbiology of Danylo Halytsky Lviv National Medical University are a combination of traditional approaches with modern innovative technologies. In particular, the focus is on the main aspects of the work of a bacteriologist, namely, early diagnosis in accordance with modern standards and protocols by Order of Ministry of Education and Sciences of Ukraine (2019). The use of the open educational resources promotes activity of participants of educational process and creates an effective educational environment, develops the competencies of teacher at preparation of educational materials and realization of educational process. In addition, motivation is a crucial component in organizing of educational activity among medical students. Development of motivation needs the purposeful pedagogical influence and new effective methods of activation of student factor are search. Today, sociologists and educators debate: "Why do one students gladly go to the university, but other refuse to study and miss classes? Why is someone successfully fit into an educational society, and for someone in a university are the continuous problems? What can motivate a modern student?" Formation of motivation among medical students is at the heart of the pedagogical success of the modern teacher. Therefore, an actual are such instruments of the open education system, as: an electronic distance learning technologies (e-learning), global social networks, an educational information networks, online classrooms, technologies for supporting interconnection with the use of mobile devices and others (Bykov, 2013; Spirin, Demyanenko, Zaporozhchenko, Shyshkina, & Demyanenko, 2012). To date, among the scientific and pedagogical staff of institutions of higher medical education, the most important task is to find models for building a motivational educational process context of informatization of medicine at different levels. In today's market conditions, this is not an easy task for the teacher of higher medical school, as he must constantly improve pedagogical and medical skills, look for new forms and ways of organizing students' educational activities forming motivational aspects, as well as develop new forms of assessing the quality of students' knowledge. In the future, the search for new rational ways of using the computer information technology in the organization of educational and research activities of students of institutions of higher medical education, and the development of methodological recommendations for students and teachers.

The aim of the study. To represent the results of theoretical analysis and empirical study of the formation of oriented educational-scientific information-computer environment on the basis of the Department of Microbiology of Danylo Halytsky Lviv National Medical University; to express of experience of experimental researches of introduction and use of separate service systems of this environment in preparation of specialists of different specialties of medicine.

Materials and Methods

In this work the done attempt to estimate the influence information-computer environment on the process of studies and perspective of the use of digital technologies in higher medical school. Determination of progress of programmatic an open system trends on-line of resources came true in the context of analysis of modern experience in obedience to operating the standards and normative documents.

Modern methods of scientific research used in process: an analysis of the systems, biblio-semantic, statistical, empirical observations and information processing of oriented educational information and computer environment in the process of students' educational and scientific activity.

In order to increase the efficiency of their use and to influence the motivational aspects of future healthcare professionals the main scientific provisions based on large groups of research with the participation of faculty members, students of Medical Faculty, Faculty of Pharmacy, and Faculty of Dentistry of Danylo Halytsky Lviv National Medical University. Using of information and computer environment in the learning process and analysis of efficiency in a time segment were investigated.

Results

The digital competence of teacher in measuring of competitiveness of higher medical establishments in forming of modern specialist in industry of health protection

Along with the traditional forms of higher education, whose target audience is entrants, medical students, masters, graduate students, doctoral students, teachers, etc., there is a distance learning specializing in narrower areas. The specialized training market is more customer-oriented than the general market, so as he is more flexible, quickly reacts on the changes of demand. This

confirmed by the theoretical analysis data, since even a higher education institution that do not specify distance-learning programs are ready to develop individualized e-learning plans. A question consists in the following: or will occupy the controlled from distance studies among medical educational establishments, the special niche in the system of education or it will remain only addition and whether will have demand. For finding out of package of questions, first of all, it should be noted that quality of education is begun with a teacher and it is a not overstatement. Firstly, a teacher carries out the role of explorer and role of adviser, due to own experience and wide knowledge. He can choose the greater useful information content from all variety that exists in an informative space and he helps for students correctly differentiate her. The motivational components reflected in Figure 1 that determine the discovery of educational activity among modern medical students.

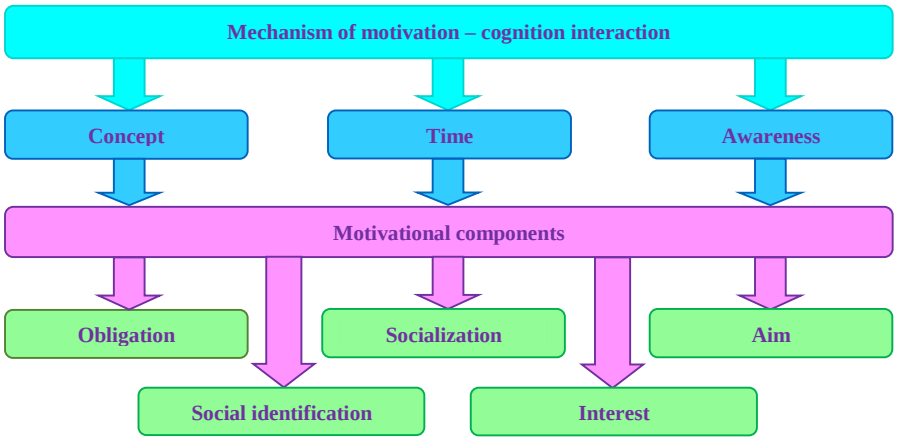

Figure 1. Motivational components in medical students.

Studying motivation as a condition for forming a successful learning activity, involves identifying factors that need to be cultivated among students, in particular: purpose, obligation, socialization, interest and social identity; is based on generally accepted standards. In our opinion, each of the motivation factors is evenly distributed (20%), although according to some scholars and educators, there is a clear hierarchy in the motivational structure. Where one of the components is dominant and other motivational factors have a subordinate position. We want to attract attention, that in each of above enumerated factors there are separate components such as: realization and conception, which are formed in the time interval of the educational process. It should be said that many scientists define certain techniques of motivation: persuasion; arousing interest; suggestion; delegation; securing a positive impression. But to our opinion, when a student realizes every factor of motivational of constituent so as a result the critical thinking is formed and the own conception of activity is formed, inclusively an educational. And motivation techniques such as coercive or pressure training have not justified themselves as a factor of motivation in today's society, because, a lot of students are unprepared for studying at the university due to a lack of understanding of their own need for knowledge and opportunities to apply them in practice. In most cases, students have for decades developed a well-known style of learning to "hand over and forget" without the pleasure of activity or without interest in the subject of teaching. Learning without self-interest and benefit leads to the inability of students to formulate the concept own applying the knowledge and practical skills received during training, because they are used to the test thinking and have problems with socialization. Although, it follows notices, that among motivational appear and other pedagogical problems for the teacher of medical establishment, related to the use of computer technologies in the educational and scientific activities of medical students, planning of on-line tutorials, technology of creation of computer-assisted educational and scientific environment. A learning technology is a relating link between the theory of studies and her by practical realization in market conditions. There are most problems with the design of training computer programs. Because, there is a huge gap between quality of the computer educational programs based on the use of pedagogical methodology, that itself did not justify. But they are put into practice in the form of the typical test systems.ithin the framework of complex research taking into account the above mentioned problematic aspects of distance learning in the design of educational and scientific computer environment based on the Department of Microbiology, Danylo Halytsky Lviv National Medical University in order to analyze the influence of information computer technologies on the content and methods of designing students' educational and scientific activities and forming motivational factors during the educational process. An electronic educational materials include: electronic textbooks and video lectures, electronic methodological developments for practical and laboratory classes and a database of computer test systems for medical, dental and pharmaceutical faculties, video presentations and imitation models of the educational process. They also include a learning management tools such as electronic journals. This is quite convenient, because in an asynchronous mode the students work with an e-learning materials independently and they pass to testing knowledge at any time convenient for him. Question that arise up during the independent working of material he can set in the mode of off line chat option that is in the system informatively educational environment. It is also convenient for the teacher, because at any time he can

analyze the activity of students, to note the most pressing questions that arise during the educational process. Let's just say, 100% of students freely use the information and learning environment in their practice. The activity of students of different faculties during the academic year was analyzed (Figure 2).

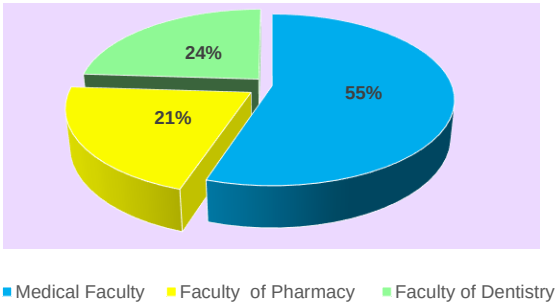

Figure 2. Students' activity in an information and communication educational environment.

Among the leaders of activity in the educational and information space was identified the Medical Faculty – 55%. Although, the result maybe was forecast as modern student society constantly is in the conditions of reflection and actualization. The Faculty of Dentistry has an active position of 24% and this is not surprising, the first, dentists' faculty worldwide, regardless of the health care system in the country, have the most experience in providing paid services to the public, second, in the early 1990th, many private dental organizations appeared in Ukraine offering paid dental services to the population (Klimenko & Smirnova, 2014). Therefore, specialists in this field care about their own educational and scientific potential. 21% an activity belongs to the Faculty of Pharmacy, on it is our opinion that due to the fact that the pharmaceutical market is one of the most dynamic and difficult in Ukraine. One of the key characteristics of this market is the high level of competition. The future pharmacy professionals are aware of the importance of using the information and communication computer environment to develop the practical skills and theoretical experience in the future employment perspective. The pharmaceutical market of Ukraine is one of the main factors in shaping the country's income, as it is quite powerful in the world market and holds the 5th position in the world in terms of maximizing the supply of domestic consumers with products. Also national exporters are highly estimated by producers on foreign markets and create a powerful enough competition to the leading world leaders (Kovinko, Stakhova, & Vovk, 2017). The modern world is characterized by the intensive development of contacts between different countries. There is an increase in the flow of young people from one country to another who are seeking higher education. According to statistics, Ukraine is ranked 9th in the world by the number of foreign students. The geography of countries from which foreign students came to the University varied: Poland, Bulgaria, Israel, Ecuador, India, Pakistan, Egypt, Morocco, Lebanon, Palestine, Nigeria, Ghana, Zambia, Kenya, Namibia, DR Congo, Cameroon, Angola, Syria, Tunisia, Iran and others. The university enrolls 1.334 international students from 47 countries. Comparative analysis of activity in the information and educational environment of the Department of Microbiology of the Danylo Halytsky Lviv National Medical University was conducted during the academic year 2019, among students of 2-3 courses of Medical Faculty, Faculty of Pharmacy, and Faculty of Dentistry (Figure 3).

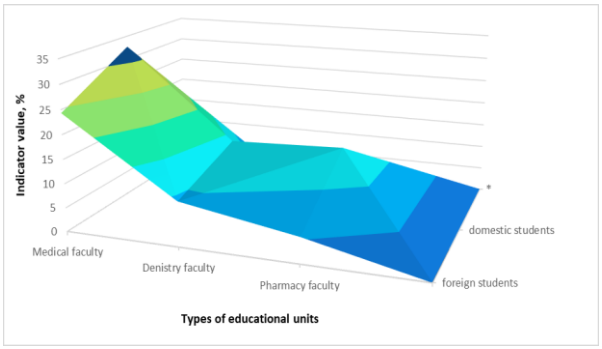

Figure 3. Comparative analysis of activity among domestic and foreign students in information and educational environment.

According to statistics, among the Medical Faculty a domestic students have the highest activity of 32.7% compared to foreign students 24.3%. A similar picture is observed at the Faculty of Pharmacy: domestic students 13.8% and foreign dentists 9.2%. Among the Faculty of Pharmacy domestic students gained 14.7% and foreign students 6.3% activity. According to the staff of the department, this is primarily due to the national and psychological characteristics of foreign students, which significantly affect the learning and success. Their adaptation to the new environmental conditions, namely: climate features, personal aspects, flexibility of the learning system, a living conditions and more. The Danylo Halytskyi Lviv National Medical University has created electronic journals of success and an attendance of classes for foreign students, and their families have the opportunity to follow the process of studies of the near in online – mode. That will significantly improve the individual educational process of each student, regardless of the direction of the faculty he has chosen. Although, it should be noted that staying in a country of foreign youth is related to the adaptation difficulties and the difference between the realities of the country from what was promised in the advertising leaflets. But if to mark, a level of cognitive activity that a foreign citizens purchased for itself on a motherland, by many parameters, there are considerable divergences in the methods of studies in the Ukrainian and foreign systems of education.

Current requirements in the training of future healthcare professionals

The Higher Education Standard is a set of requirements for the content and results of the educational activity of higher education institutions, including medical and scientific institutions for each higher education level within each specialty. The Higher Education Standart defines: the integral, general, and special competencies of the graduate, such as the ability to choose a communication strategy; ability to work in a team;

knowledge and understanding of the subject area and understanding of the profession. Among the professional competencies, distinguish a capacity to establish a preliminary clinical diagnosis of the disease, skills in collecting patient information, an ability to evaluate the results of laboratory and instrumental research, the ability to determine the principles and nature of the treatment of diseases. Particular attention is paid to using an information and communication technologies skills. The most medical students evaluate themselves as a "confident ICT user", who is able to work with lot of types of modern information systems. Our students systematically use the software to perform a various types of learning tasks and communicate with teachers, etc. The staff of the Department of Microbiology conducted an analysis of the qualification requirements of a clinical or medical microbiologist in Ukraine and abroad (Table 1).

Table 1. Comparative analysis of qualification requirements of clinical or medical microbiologist in Ukraine and abroad.

Knows and uses in activity "doctor-virologist and microbiologist"	
Ukraine	**Abroad**
Health care legislation and regulations defining the activities of management bodies and health care institutions.	Consultation and advice regarding the appropriate initial investigation of pediatric and maternal patients suspected of infectious disease.
The rights, responsibilities and responsibilities of the microbiologist-virologist.	Interpretation of laboratory information derived from microbiology testing for the diagnosis and management of pediatric and maternal patients.
Basics of epidemiology, microbiology, immunology.	Identification of specialized microbiological testing appropriate for intensive care of patients in acute care clinical areas as well as patients with endocrine, cardiac, immunological, gastrointestinal, and renal disorders.
Pathogenic, conditionally pathogenic bacteria.	Assisting clinicians in development of test algorithms for diagnosis of infections in patients with complex disorders.
Microflora of the environment, its impact on human life.	Assist in the medical oversight and clinical direction of the antibiotic stewardship program. Provide clinical consultation for antibiotic stewardship.
Modern methods of microbiological and virological research.	Research & Diagnostic Test Development. Basic and applied clinically relevant research in the area of Clinical Microbiology/Virology in collaboration with internal and external scientists and clinicians. Continuing diagnostic test development to improve existing methods, replace outdated technology, evaluate new technology, and implement testing for emerging pathogens.
Diagnosis, prevention and treatment of infectious diseases.	Assist in monitoring the accuracy, precision, and clinical relevance of laboratory test results through the implementation of both internal and external quality control programs. Continuous review of the testing menu to identify obsolete tests and areas where introduction of new testing is warranted.
Principles of laboratory diagnostics of viral infections: rapid methods of isolation and determination of virus types, serological diagnostics.	Collaborate with national surveillance organisations and public health authorities and to provide services for these organisations.
Safety rules when working with microorganisms, viruses.	Participate in the training programs for medical microbiologists, infection control doctors and other experts in the field of microbial diseases.
Rules of registration of medical documentation; modern literature on the specialty and methods of its generalization.	Undertake research and development in the specialty of Medical Microbiology.

The research makes it possible to outline the essence of the problem and to adapt the information and educational environment of the department as a factor of future competitiveness.

Among the tasks and responsibilities in the requirements for the future specialists there are no differences both in Ukraine and abroad. A specialist follows a current legislation about a health protection and normative legal acts that determine an organization of medicare to the population, and an activity of organs of management, and an establishments of health protection. Applies modern methods of prevention, diagnosis, differential diagnosis, treatment, rehabilitation and medical examination of patients, gives them quick and an urgent medical care. Carries out a safety studies of medicinal products in which there is a predictable risk of certain types of severe adverse reaction. Plans work and analyses her results. Conducts medical documentation. Adheres to principles of medical deontology. Specialization is after certain speciality of medical profile (internship, specialization courses). Certificate of a specialist without requirements to the experience of work. Because in today's market conditions, the employer is more focused on the potential of the future employee. To get qualification of clinical microbiologist in abroad need to pass a specialization of microbiology not less than 60 months. Where one or more subjects such as a laboratory management, a health care and and an infection control, practical clinical training, that can be flexibly integrated into a medical microbiology. In order to be able to cover the whole field of medical microbiology, the approximate duration of training should be medical microbiology (at least 24): bacteriology – 12 months, virology – 8 months, mycology – 2 months, and parasitology – 2 months. Laboratory management (up to 6 months), public health and infection control (up to 12 months), clinical medicine (minimal 12 months), scientific project (6 months). Direct stationary help and out-patient's clinics from infectious diseases, HIV/AIDS, tuberculosis or related specialties (6 months).

Discussion

Medical education in today's market environment is an open social system that is in a state of continuous development. Are inherent certain tendencies her in particular globalization, integration, informatization. All these tendencies contain historical aspects of development, but there yet are many problems related to the creation of an information and communications technology in the higher schools of medical education. The peculiarities of introduction an information and communication technologies in an educational process were investigated by Bak (2014); Dyshlieva (2010); Shevchenko (2017); Vorozhbyt (2018) and others. The analysis of researches testifies to the high enough level and versatility use of ICT in modern home and foreign education as facilities: visualization, scientifically-searching activity, development of creative potential, testing and control of results, automation of process of studies and also as interactive facilities of cognitive activity (Sereda, Savinova, Stelmah, & Biliuk, 2019). However, despite the multivector, the use ICTs in the practical work of a modern teacher of higher medical school is abstract enough. In particular, it touches to distance learning at a higher medical institution. There is a lot of thought about the actuality and feasibility and costs of installing and maintaining a distance learning system. The speed and high quality of the provision of educational services with the help of computer information technology in the higher medical school, where the full-time learning cycle is traditionally kept, provides a convenient and effective level of assessment of the acquired knowledge and access to the system on the Internet, enabling you to participate in the learning process from any corner of the world. Assists providing of competitiveness of educational establishment, etc. (Horta, 2009; King Head, 2011; Zlámalová, 2007). The analysis the development of global higher university education in a world (Duderstadt, 2007; King Head, 2011) testifies that under act of modern computer and telecommunication technologies, and also with development of market relations in the field of education the new models of universities are forming (Jarolímek, 2008). Which have their own views of concepts on the competitiveness of healthcare professionals and different trends of their formation, this presented in the works of researchers, such as Filippova and Tverezovska (2010); Krymova (2015); Kubanov (2014); Nauholnykova (2016) and many others. Ability to use modern ICT is one of the important conditions for competitiveness of the modern specialist in the medical field. For the first time in the article "The Four Principles of Sufficient Reason" Schopenhauer introduced the term "motivation", which scientists would later use for explanation of behavior of people and animals (Ilin, 2011). Researches of motivation have been carried out by many domestic and foreign scientists in different directions. One of directions it is integrative approach when in the process of professional preparation of specialists forming of knowledge, abilities, competenses is provided and it carries in itself summarizing scientific constructions, come out of the system of pedagogical, psychological, methodical, special and other knowledge of teacher, that allow to him successfully to carry out pedagogical activity. It is also being considered a contextual approach that creates learning conditions that foster the development of creative and critical thinking in which information that a student receives would be understood, perceived with their own experience, and their own analytical judgments would be formed.

Pedagogical and psychological aspects of training of future specialists were studied by Melnyk and Pypenko (2017; 2018), in the educational process in medical education – by Melnyk, Yekhalov, and Sedinkin (2020). By course of study, to the significant psychological factors in formation the motivational sphere of students medical, including the content of the value-semantic sphere of the teacher, experience in the main activities in higher education (experimental science, scientific and methodological, pedagogical), as well as personality qualities teacher, that accumulated in the professional mastery and competence (Dzjubenko, 2000). At present, there are about 50 theories motivation in foreign psychology, which confirms the multidimensionality of this phenomenon "The key to solving the problem of encouraging people to work effectively, orienting professionals to achieve professional goals is to determine their motivation", – Ivanova (2016) emphasizes. One of the best ways to generate motivation, according to the staff of the Department of Microbiology, Danylo Halytsky Lviv National Medical University, it is the use of information and communication learning technologies that include software, hardware, computer and communications, as well as the creation of modern virtual laboratory centers and innovative methods of their application to ensure high efficiency and informatization of the educational process. In today's market conditions, an automation of medical establishments it is of creating the unified medical information space, which in turn makes it possible to automate doctors' jobs, organize the work of the medical statistics department, to create databases, to keep electronic medical records and to unite all medical, diagnostic, administrative, economic and financial processes. Among the medical programs of the information and communication space of LPU, which have recently been developed, is the laboratory information system LIS MeDaP of BioHimMak, the Altey Laboratory system of Altey. The desire to combine different software complexes led to the creation of LIS MeDaP, Dexter and Laboratory Journal of the Laboratory Diagnostics Company. Feedback systems for diagnostics and corrective treatment are available, for example, cardio monitoring "Doctor A", Breath Maker program for the treatment of stuttering of NPC biocybernetics and computer monitoring tools "Doctor A", Holter monitor "Cardiotechnics 4000" from Ecomed + Software and hardware complex Integrator.

Conclusions

Review literature does not completely reveal the problem, but it does allow us to draw some conclusions of long-term researches and to determine the range of issues for discussion and the direction of further work. At present it is difficult to detect the trend of development of distance learning in higher medical institutions, because a universities use different formats

and, as a rule, as an auxiliary element in the educational process. Conducted the theoretical analysis made it possible to determine the organizational and pedagogical conditions for the development an information and communication surroundings for future healthcare professionals. It is possible to say, that an introduction ICT at different stages of the educational process for future professionals is the next step in the development of medical education. Organically combined use ICT for implementation of educational tasks by students and organization of the classroom work using ICT to forming of base skills and to helps to better shape the competitiveness of future healthcare professionals. Further research should be directed to the development a models and methodological basis for the development of information and communication environment for the preparation of future masters of medicine. This issue is topical, debatable and needs further consideration. Extending standardized interactive learning engages students in independent learning, thus forming a motivation for self-development and sustainable improvement of their skills in ICT. By influencing on the motivational component but in some circumstances, it is a decisive factor in the development of professionalism. Install difficult, yet achievable goals, adjust the selection as assignments to maintain optimal incentives for use of the potential student. The quality and professionalism of distance learning meets basic Pan-European principles such as transparency, objectivity, impartiality, impartiality and it is makes possible to recommend for implementation in the national medical education system.

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Permission for this study was obtained from the ethic committee of institution and informed consent was obtained from students.

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REVIEW ARTICLE

ICT Concepts Development in Educational Theory and Practice since the Time of Independence of Ukraine

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A – Study design;
B – Data collection;
C – Statistical analysis;
D – Data interpretation;
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G – Funds collection

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Abstract

Background and Aim of Study: *The article deals with ICT concepts in the educational theory and practice of Ukraine. It is noted that scientists are exploring different aspects such as a concept, a strategy for implementing the concept, real experience, etc. The analysis of ICT concepts in education which were created during the independence period, has highlighted a number of contradictions that accompany this process.*
The aim of the study: to consider ICT concepts which were created in the system of education in Ukraine during the independence period.

Material and Methods: *In the study, the following general scientific methods were used: analysis (historical and pedagogical), synthesis, comparison, generalization.*

Results: *ICT concepts implemented in Ukraine's education, not only attest to the emergence of innovative information and technological realities in the field of science and education, but also are considered to be new realities, and therefore need to be researched by scholars of different branches – philosophers, educators, sociologists, psychologists, etc. – both in terms of methodology and trends of changes in the reference field of educational informatization.*

Conclusions: *ICT concepts in Ukraine's education, created during the independence period, reflect the course of a controversial process of a state formation. Being innovative by design, concepts, laws, strategies, programs, etc. have been based on traditional, or even outdated, principles of state development. A legislative approval of the National Program of Informatization and periodic changes in innovative nature of its content in relation to ICT in education, showed progressive trends of conceptual importance.*

Keywords: *ICT concepts in education of Ukraine, conceptualization, the New Ukrainian School, National educational electronic platform, pedagogy*

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Introduction

Education as a sociocultural phenomenon of state formation and development focuses on the set of achievements, problems and challenges that always accompany Ukraine during 29 years since the momentous event of gaining independence. Applying a metaphorical technique, we allow ourselves to use a conditional parallel to the interpretation of such words as "a focus" and "to focus", defined in dictionaries as 1) the point at which parallel rays (streams), refracted by lens or reflected by a spherical mirror, gather; 2) to adjust an optical system to get a clear image. In our opinion, the effective education system is the conditional point that focuses on (that is, reflects) the course of social changes, and which not only illustrates the process of state development during the independence period, but also it becomes the mechanism and means of this development itself. The system of education is the basis for a scientific analysis of many components, including the diversity of ICT implementation aspects in education, which collectively define a rare, unusual, exceptional, unique phenomenon and the name of this phenomenon is independent Ukraine.

In particular, the National report on the state and prospects of education in Ukraine (Kremen, 2016) states that twenty-five years of Ukraine's independence have been marked by the formation, implementation and modernization of state education policy. In the period up to 2002, Ukrainian self-sufficient national education system which corresponded new social relations, gained an innovative potential for further development. Since 1991, adopted laws on education, scientific and technical activities have certified national self-identification of education. The establishment of educational legislation began and the National Doctrine of Educational Development was approved (President of Ukraine, 2002).

The next decade was marked by an increasing transformational impact on education because of European integration and globalization. In national education, the gaps between the best European and world practices were evident; it also touched the ICT concept. Since 2014, a new perspective on the quality level and social role of education has been established in Ukraine. The innovative Laws of Ukraine "On Higher Education", "On Scientific and Technical Activities", "On Education", Conceptual Principles of Secondary School Reform "New Ukrainian School" (Ministry of Education and Science of Ukraine, 2016), numerous educational acts have been adopted. All these helped update national education systematically. Finally, the National strategy for the development of education in Ukraine in for the period up to 2021 (President of Ukraine, 2013) identified and consolidated main priorities of education at the state level.

However, as it was proved by the educational practice, in most cases these are only slogans about the implementation of ICT concepts which sound really very well. The basis for this statement is the condition of the use of ICT in the learning process at all levels of education. Unfortunately, in the interpretation of real educational practice, they mostly perform the function of "a handle", that is, the means of fixing information at one or another level of complexity. World experience, which has been offered to Ukrainian educators by foreign partners for over 20 years (educational projects Intel, Microsoft, etc.), shows that the purpose of ICT is to create, develop and implement innovative ideas in all spheres of people's and country's lives. The experience of the conceptual approach to the functioning of Silicon Valley is a confirmation of an exclusive mission of ICT concepts in the world's socio-economic progress.

Therefore, we consider the analysis of ICT concepts, created in the national educational theory and practice, is an urgent problem that requires a scientific research in several areas such as a concept, a strategy for implementing the concept, real experience, and so on.

The aim of the study. To consider ICT concepts which were created in the system of education in Ukraine during the independence period.

Materials and Methods

In the study, the following general scientific methods were used: analysis (historical and pedagogical), synthesis, comparison, generalization.

Historical and pedagogical analysis of various sources were used to see the historical dynamics in the development of the education system and the problems of developing ICT concepts in particular.

Results and Discussion

Scientists of Ukraine consider that it is urgent to study general tendencies of reforming the national education system not only as a single unit, but also in relation to the development and approval of the information society. Specific phenomena and processes related to ICT in education are also studied, challenges and reasons for failure for achieving goals of the use of technology in education are analyzed (Gurzhiy & Lapinsky, 2013). In particular, Bykov, Spirin, and Pinchuk (2017) state that Ukraine has imbalanced indicators or a significant lag behind the developed countries in the development of the information society. The authors refer to the results of international studies (International Telecommunication Union, 2016) and confirm the validity of the conclusion made by the experts who discussed the state of informatization of education during the round table talks: "the introduction of modern technologies is significantly delayed, but an internal and external digital gap is increasing; there is no consolidated national ICT development strategy. It slows down the pace of creation and exchange of information, knowledge, experience and technology" (Committee on Science and Education of the Verkhovna Rada of Ukraine, 2016).

Bykov (2009) emphasizes that general tendencies of informatization of education are the formation tools of information and technological platform of open education. Gurzhiy and Lapinsky (2013) analyze informatization conditions of secondary education establishments, and he also generalizes problems and topical changes.

Morze (2010) as a developer of textbooks, techniques and many other aspects of ICT implementation, offers

strategic techniques for overcoming difficulties encountered by teachers.

ICT in high school is described in research of Melnyk (2016); Kostikova (2018); etc.

The experience of Ukrainian scientists in the implementation of a whole complex of aspects under study is presented in (Ziaziun, 2014). However, there is a lack of specific researches that comprehensively analyze ICT concepts in Ukraine's educational theory and practice.

A generalized definition of "a concept" (conceptio – understanding) is a system of views, one or another understanding of phenomena and processes, a single, defining concept, which focuses on understanding the ICT concept as a phenomenon. We can assume that there is some inefficiency in the implementation of ICT in education of Ukraine and we have to deal with a lack of proper conceptual approaches, i.e. a coherent system and a single defining concept. In addition, the concept is not identical to theory or strategy, an educational policy or educational practice, but a specified identification is often accompanied by a scientific research, which leads to a traditional confusion for researchers in the content of definitions.

In our opinion, it forms a number of contradictions that accompany ICT in the education of Ukraine (Figure 1).

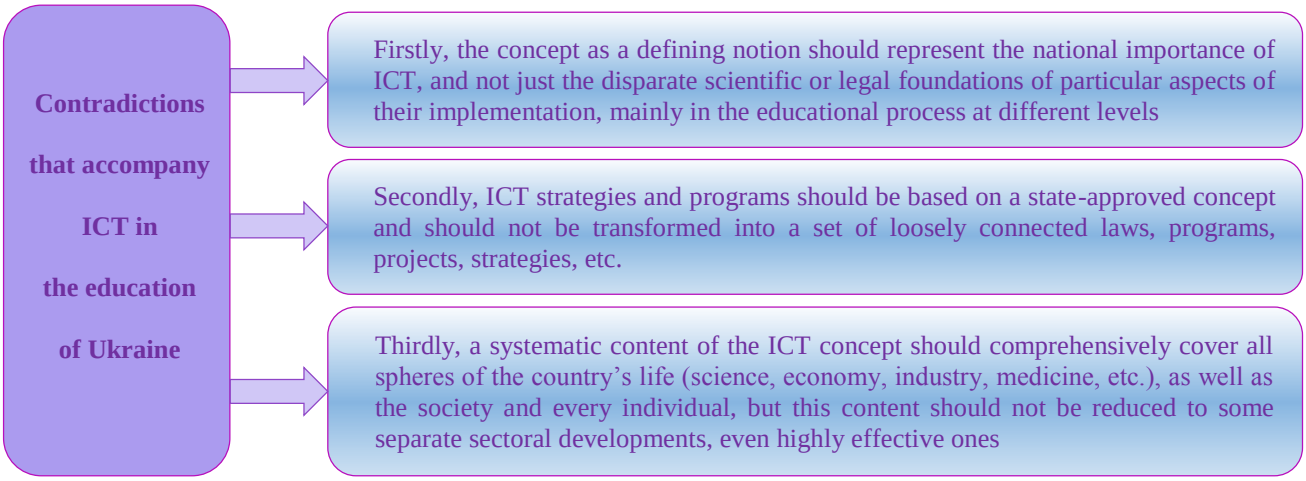

Figure 1. A number of contradictions that accompany ICT in the education of Ukraine.

For example, the Program of informatization of the legislative process in the Verkhovna Rada of Ukraine for 2012-2017 (Verkhovna Rada of Ukraine, 2012) and the Resolution "On Measures for Creation of Electronic Information System "Electronic Government" (Cabinet of Ministers of Ukraine, 2003) should be based on common conceptual principles of the country regarding ICT, but their content does not mention this concept.

The question arises about the effectiveness of those ICT concepts that could be identified as leading in Ukraine's education. Since ICT concepts are dialectically linked to such global concepts as the information society and the informatization of education, they must be provided with deep scientific development, validation, validity, legislative documents, highly qualified specialists, logistical resources, etc.

At the legislative level, since Ukraine's independence, a considerable number of laws, decrees, etc. have been adopted, and they cover this interconnection and determine the diversity of their implementation in education in order to create an information society in the country on the basis of inclusive informatization. Here are only the most significant ones that were defined during the first decade (Table 1).

Even a cursory glance at the legislative field of the first twentieth anniversary of country's independence concerning ICT allows us to argue that the conceptual view of this problem is largely characterized by the Law of Ukraine "On the National Program of Informatization" (Verkhovna Rada of Ukraine, 1998), this law has been systematically updated and supplemented over the years (2006; 2011; 2013; 2016), which affirms the importance of providing a conceptual approach to solving problems of social and state importance.

The latest version of this law provides the following understanding of informatization: "Informatization is a set of interrelated organizational, legal, political, socio-economic, scientific, technical and production processes which are aimed at creating conditions for meeting information needs of the society and a realization of citizens' rights on the basis of development and the use of information systems, networks, resources and information technologies, created with the help of modern computer and communication technologies (Verkhovna Rada of Ukraine, 2016).

The National Commission is defined as a strategic regulatory authority of the country in the field of information technologies. The Commission carries out state regulations in the field of communication and informatization. The official site of this Commission states that the state regulations should ensure the systematic, comprehensive and coherent development of the country's informatization. The National Programme of Informatization includes: The Concept of the National Programme of Informatization, a set of State Programs for Informatization, sectoral programs and information projects, regional programs and information projects, programs and projects for informatization of local self-government bodies. The National Program of Informatization (Verkhovna Rada of Ukraine, 2016) defines a strategy for solving the

problem of providing information needs and information support for socio-economic, environmental, scientific, technical, defense, national, cultural and other activities of national importance. Main areas of informatization are presented in Figure 2.

Table 1. The list of the most significant legislative documents on creation an information society in the country on the basis of inclusive informatization.

Document type	Document title	Year of implementation
The Law of Ukraine	On the Concept of the National Program for Informatization	1998
	On General Secondary Education	1999
	On Basic Principles of Information Society Development in Ukraine for 2007-2015	2007
The Decree of the President of Ukraine	On Measures to Develop a National Component of the Global Internet Information Network and Provide Wide Access to this Network in Ukraine	2000
	On Additional Measures to Ensure the Development of Education in Ukraine	2001
	On Urgent Measures to Ensure the Functioning and Development of Education in Ukraine	2005
	On Priority Tasks for Introduction of the Latest Information Technologies	2005
	On Measures to Ensure Development of Education in Ukraine as a Priority	2010
The Verkhovna Rada Resolution	On Approval of the Regulation on Information of the Verkhovna Rada Advisory Council	1998
The Resolution of the Cabinet of Ministers of Ukraine	On Approval of the Regulation on the Formation and Implementation of the National Informatization Program	1998
	On Approval of the Program of Informatization of Secondary Comprehensive Schools, Computerization of Rural Schools during 2001-2003	2001
	On Approval of the Comprehensive Program which Provides General, Vocational and Higher Educational Institutions with Modern Technical means of Education for Natural, Mathematical and Technical Disciplines	2004
	On Approval of the State Program “Information and Communication Technologies in Education and Science for 2006-2010”	2005
The State National Program	Education (21st Century Ukraine)	1993
The National Doctrine	The National Doctrine of Educational Development	2002
The State Program	The State Teacher Program	2002
The Development Program	The Development Program of Distance Learning during 2004-2006	2004
The Concept	The Concept of Development of Distance Education in Ukraine	2000
	The Concept of General Secondary Education (12-years school)	2001

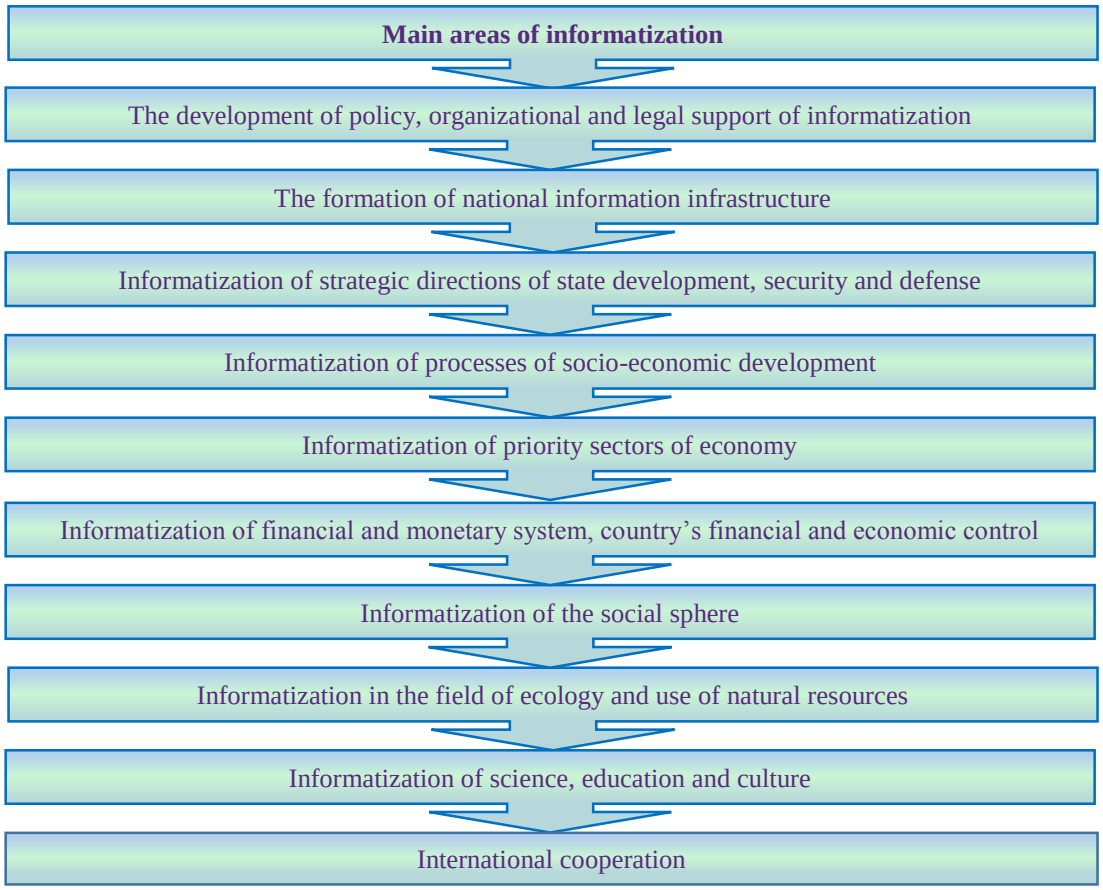

Figure 2. Main areas of informatization.

Although, the position on informatization of science and education in the list above is almost the last, in our opinion, the content indicates that the process of expected conceptualization of ICT has begun.

Among the documents adopted during the specified period, only two were designated as concepts: 1) the Concept of Development of Distance Education in Ukraine (Ministry of Education and Science of Ukraine, 2000), and 2) the Concept of General Secondary Education (a 12-years school) (Ministry of Education and Science of Ukraine, 2001). Both concepts formally fit the purpose, but rather give a desirable perspective on ICT implementation. For example, the Concept of General Secondary Education (a 12-years school) (Ministry of Education and Science of Ukraine, 2001) only states that students need to own a computer, but obviously this is not enough.

We support Vashkevych's (2016, p. 133) statement about the essence of the conceptualization phenomenon as the basis for the conclusion: "Conceptualization is a theoretical organization of ontological representations. It reflects possible tendencies for changes of a reference field of the research and allows us to produce new hypotheses about the character and nature of interconnections of the information society, evolving in the conditions of globalized society and which is described in special terms – concepts. The conceptual scheme determines a theoretical understanding of study integrity, supports the systematic representation and semantic essence of a research paradigm. Within the structure of scientific theory, the conceptual scheme of research is being transformed as a fundamental theoretical scheme, which should be interpreted as the scientific picture of the world in the context of the historical evolution of the scientific picture of the world". According to this approach, the ICT concept in education as a phenomenon of national importance at a goal-setting level should be recognized as the basis of strategies, programs, projects, etc. at all levels of country's existence, and, of course, in the field of education, based on its priority role, ensuring its own concept.

It is evident that most European countries have developed and implemented their national ICT concepts as a wide range of actions at the national level, ensuring the use of the Internet by all citizens, acquiring ICT competences in the education system of different levels and purpose, as well as specifying ICT strategies in education as a key public sector.

The Eurydice European Education Network has carried out a comparative analysis of Key Data on Learning and Innovation through ICT at School in Europe (EACEA P9 Eurydice, 2011). The activities of schools in more than 30 European countries in 2009-2010 were analyzed: how they teach in general and how they teach ICT in schools, how they use ICT to bring innovation to the educational process, and how they support students. The evolution of ICT infrastructure at schools was also studied in terms of networking, hardware and software development. The use of ICT in the educational process and their implementation in curricula were also under the research. The role of ICT in the formation of the 21st century skills was examined separately. They found that since 2000 national ICT strategies had been applied in all European countries. In particular ICT strategies in education are aimed at implementation and the use of ICT. Trends in the development of modern education systems in European countries are adjusted to the digital agenda for Europe (Fact Sheets on the European Union, 2020). Digital policy for Europe can be seen as the ICT concept because it defines a state-wide approach to a wide range of components: providing the population with electronic services; creating a fast and secure broadband network; helping Europe's population gain high-level ICT skills, etc. Today, 28 European countries have national ICT strategies in education which are based on the concept. And if Finland and Poland are just starting to form ICT strategies in education, then Sweden has significant national gains along the way.

The integration of Ukraine into the European community of states, in particular into the European educational space, citizens' demands for competitive education, powerful theoretical and methodological studies in various fields of economic and social knowledge, have led to the updating of previously defined scientific principles and legislative approaches to ICT implementation in the system of education. This also has led to the development of fundamentally new documents that can be recognized as ICT concepts because of the perspective of the goals and the content value.

The benchmark in the integration processes of Ukraine is the analysis of Turkish scientific research. Ozar (2013a) demonstrates the need for planning, implementation and evaluation of educational experience in schools. The author emphasizes on the need to identify the cognitive, affective, dynamic and social features of students. In his opinion, it is important to regularly monitor the development stages of each aspect in the process and communicate the results to all interested parties (Ozar, 2013a, p. 25). Exploring the problem of continuous learning, Ozar (2013b) in another publication claims that education professionals can help another person learn. For this reason, in schools should focus on the phenomenon of learning. "Teachers" teaching at the school according to the principles of traditional education, mainly act by the reflex of controlling the behaviour of "students" (Ozar, 2013b, p. 39).

In 2010, the Cabinet of Ministers of Ukraine approved the Concept of the State Targeted Program on Introducing ICT into the Educational Process of Secondary Educational Establishments "One Hundred Percent" for the period up to 2015 in order to realize equal access to quality education, comprehensive approach to the use of modern technical, methodological, educational information resources, building the information society. The draft of National Strategy for the Development of Education in Ukraine for 2012-2021, approved by the third all-Ukrainian Congress of Teachers, prioritized the introduction of ICT to ensure the improvement of the educational process, the accessibility and effectiveness of education and preparation of the young generation for social life.

The timeliness and importance of these documents have been exacerbated by the demands of educational

practice, and they have begun the process of developing conceptualization of education concerning ICT. We share Zhaldak's (2013) opinion that the problems of informatization of the educational process are complex and, above all, pedagogical. These problems determine the content of a new branch of pedagogical knowledge that goes far beyond the school course of informatics and covers the whole educational process, which becomes more democratic and humanistic because of the skillful ICT application. Thus, the prerequisites for the justification and implementation of open educational systems are created. Consequently, the emergence of such concepts is conditioned by the renewal of public needs and citizens' individual requests for effective education.

In 2016, the Ministry of Education and Science of Ukraine published the first version of "Conceptual Principles of Secondary Education Reform" and invited everyone to discuss it. The document made the ideology of changes in education clear, and it was embedded in the draft of a new basic Law "On Education". The socio-political dialogue over the Conceptual Framework for more than 3 years has led to numerous responses both in the media and on social networks. The introduction to the New Ukrainian School concept states that more than 60 letters with comments and proposals were sent by active citizens and public organizations, individual educators and pedagogical teams of educational institutions as well as by local education councils. As a result of the dialogue, a revised version was created. Of course, all the proposals cannot be taken into account, but we tried to satisfy public requests, add essential points, take into account constructive criticism. Thus, the New Ukrainian School is, in fact, the first document in education that conceptually corresponds to the content and purpose.

In particular, the Concept defines the formula of a new school: the school should be at the forefront of social changes, because "in Ukraine, as well as in the whole world, the so-called generation Y, or "children of the millennium", is gaining its value. For them life means is constant creativity, harmony between making money and learning something new, self-improvement and having fun". The formula of the new school consists of nine key components, including the "cross-cutting use of information and communication technologies in the educational process and management of educational institutions and the education system. The introduction of ICT in the educational sector must move from one-off projects to a systematic process that covers all activities. ICTs will significantly increase a teacher's capabilities, optimize management processes, and as a result form the technological competencies which are important to our students in this century" (Ministry of Education and Science of Ukraine, 2016). Among the 10 key competences of the New Ukrainian School there is a digital competence, which implies confident, yet critical use of information and communication technologies (ICT) for creating, finding, processing, exchanging information at work, in public space and in private communication. Information and media literacy, programming basics, algorithmic thinking, database management, Internet security and cybersecurity skills are very important nowadays. Understanding the ethics of working with information (copyright, intellectual property, etc.) sometimes can be crucial in modern society.

This concept has become the basis for the emergence of the Concept of providing secondary education recipients with E-textbooks and other electronic educational resources "The National Educational Electronic Platform" (Ministry of Education and Science of Ukraine, 2017), approved by the working group on the development of the Concept of the National Educational Electronic Platform at the meeting in December 15, 2017, chaired by the Minister of Education. The introduction of the document states that the Concept was prepared as a result of a public policy dialogue. More than 20 expert interviews, extensive desk studies on the best foreign experience, three working group meetings, an extended meeting on the role of e-textbooks, more than 10 workshops and Skype conferences were organized. In order to implement the Concept, memorandums of understanding public, international and donor organizations will be signed. By the end of 2020, the legal acts which are necessary to start the process will be elaborated. The documents will be developed as a result of a dialogue between experts, stakeholders, government agencies, public and international organizations. Thus, as a concept, the National Educational Electronic Platform (Ministry of Education and Science of Ukraine, 2018) defines a set of documents, measures, resources to achieve the expected results in providing secondary education recipients with E-textbooks and other electronic educational resources.

Scientists Sosnin and Kononets (2017); Voronkova (2015) consider new information and technological realities of communication in the scientific and educational activities to be the key features of innovative development of society defines the Internet as a new supranational reality, Kyrychenko (2017) points to the conceptualization of the ideology dimensions of the information society in the humanitarian and scientific discourse of the 21st century. Predicting the further development of conceptual models in educational policy, most participants of the International Conference "Education Reform in Ukraine: Information and Analytical Support" (State Scientific Institution "Institute of Educational Analytics", 2017) noted that aspects related to ICT needed 1) the methodology of researches to be updated, 2) to identify relevant issues, 3) to have practical orientation, etc. For example, Savchenko (2017) points to the need for scientific substantiation of public administration principles (in accordance with the theory and practice of public educational policy) and a conceptual definition of a public management paradigm.

Conclusions

To conclude the article, it should be noted that ICT concepts in Ukraine's education, created during the independence period, reflect the course of a controversial process of a state formation. Being innovative by design, concepts, laws, strategies, programs, etc. have been based on traditional, or even

outdated, principles of state development. A legislative approval of the National Program of Informatization and periodic changes in innovative nature of its content in relation to ICT in education, showed progressive trends of conceptual importance.

The markers of positive changes that accompany the development of the information society in Ukraine and modernization of the education system are the Conceptual Principles of Secondary School Reform "New Ukrainian School" and other electronic educational resources "National Educational Electronic Platform". Acceptance of these concepts by society and the state as common values optimizes the further development of ICT in education.

Therefore, the near-term outlook of our scientific exploration are linked to the identification of new trends of conceptual importance in educational practices, focused on the effective use of ICTs and the study of their impact on overcoming contradictions in the educational space of Ukraine.

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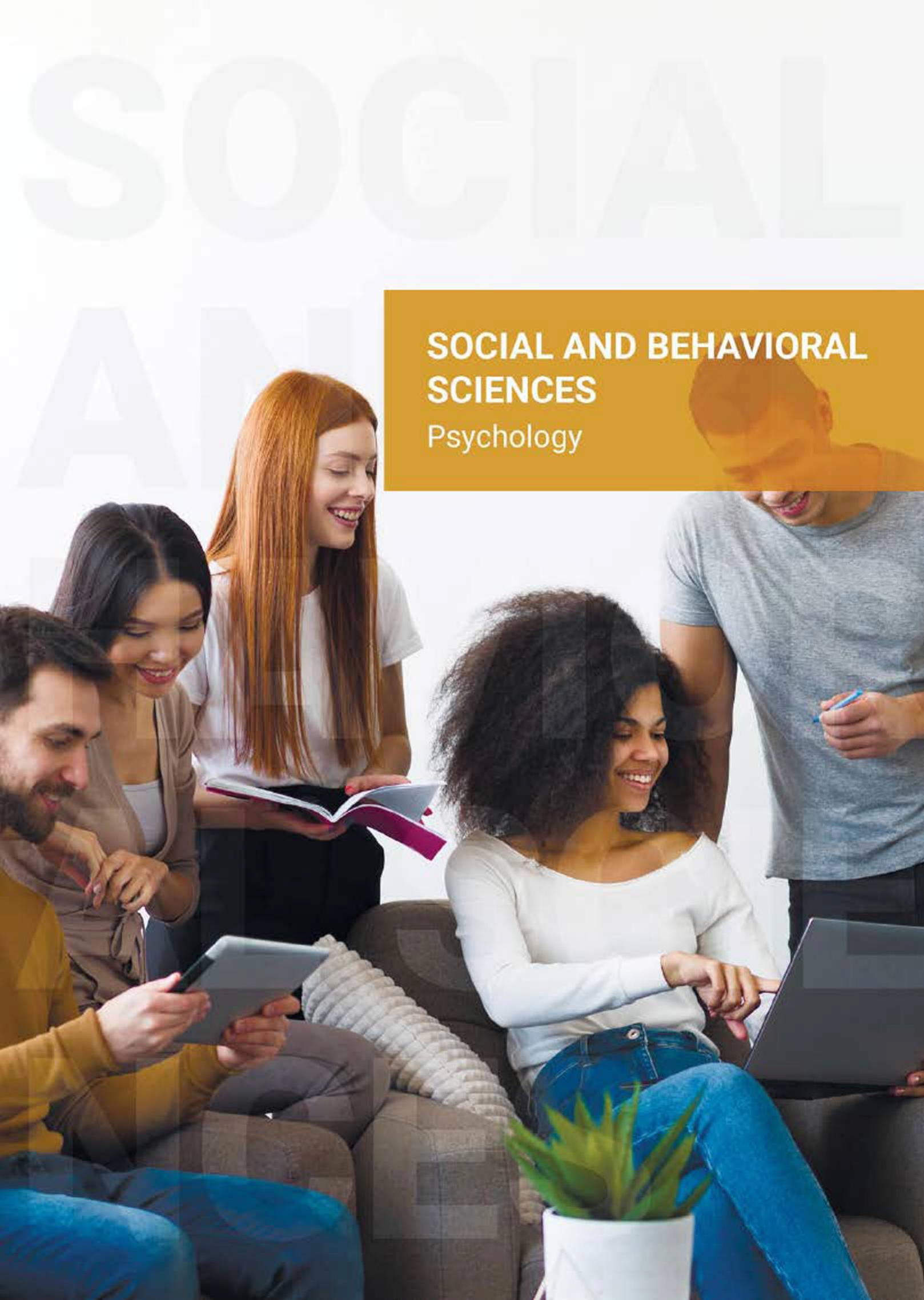
SOCIAL AND BEHAVIORAL SCIENCES

Psychology



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SOCIAL AND BEHAVIORAL SCIENCES. Psychology

REVIEW ARTICLE

Influenct of Sociocultural Factors on Formation of V. I. Vernadsky's Personal Qualities

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Author's Contribution:
A – Study design;
B – Data collection;
C – Statistical analysis;
D – Data interpretation;
E – Manuscript preparation;
F – Literature search;
G – Funds collection

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Abstract

Background and Aim of Study: *The article deals with the process of formation of the outstanding scientist V. I. Vernadsky's personality.*
The aim of the study: to research the main factors of the environment that influenced the development of V. I. Vernadsky's personality in his childhood and adolescence.

Material and Methods: *Theoretical and biographical methods have been used in the article. The preconditions for the formation of the outstanding scientist's personality have been analysed. The research focus is on the writer's environment. Attention has been paid to the macro environment of Volodymyr Ivanovych as the intellectual network of the Vernadsky family.*

Results: *The analysis of social, political and economic problems of society which influenced the formation of the outstanding scientist's personality and his views has been presented. The influence of the main institutions on V.I. Vernadsky's development has been analysed. The research focus is on the scientist's family environment. Attention is paid to Vernadsky's microenvironment. The educational conditions that can be effective in the formation of a personality's scientific thinking have been analysed. As a result, the main factors affecting the personality's development during university studies have been found out. The factors that influenced the formation of scientific talent in Vernadsky's ordinary life have been studied. It has been revealed that the formation of a worldview mainly depends on general behavioural factors and rules that exist in a society or a group of people where a personality grows.*

Conclusions: *The main macro-factors that influenced the development of the outstanding scientist's personality were the following: a noble origin; the intellectual network of the Vernadsky family; the influence of prominent scientists who taught at university; social activity of the advanced part of society. So, micro and macro environments are an important factor in the conditions of which an individual develops.*

Keywords: *V. Vernadsky, personality developing environment, socio-political situation, worldview, society*

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Introduction

The relevance of a personality's development exists outside of time. Both today and in the past centuries scientists were preoccupied with this issue. The role of a talented person in the development of society is essential. A high-level specialist cannot only make a certain contribution to the development of the sphere but also open up new paths in both scientific and philosophical knowledge of the world. Of course, these searches are not easy and must be carefully prepared. There arises a question of studying talented scientists' environment in order to extrapolate the main factors into a personality's development.

Studying various societies, scientists came to the conclusion that the social environment affects the development of an individual's creative abilities and potential. Features of interaction form certain requirements for a person and create conditions for the development of an individual's qualities which are in demand by this particular stage of development of the society. That is, during the study, self-development in the process of life an individual's natural abilities develop in accordance with the requirements of society. An important factor is personal activity during the learning process and creative activities. This expands the boundaries of the tasks and goals that an individual set for himself or herself.

According to Sysoieva (2006), the formation of a creative personality as a conscious social being takes place sequentially, becoming more complicated in accordance with the stage of development in an accessible system of social relations. So, a personality's development goes through certain phases which have life features, corresponding structure of mental activity, level of development of the substantive, motivational and operational aspects. A gradual transition from one phase to another occurs in accordance with the laws of a personality's development. However, each person goes through these phases in his or her own way, depending on the social conditions of life, the presence of a developing environment and problematic training. However, it should be noted that each previous phase prepares the next one, the previous state of the personality turns into a new one, and these transformations are irreversible.

Kryvokon (2007, p. 11) admits that "formation of a personality is a complex process of acquiring and transforming individual socio-cultural and socio-typological qualities of society, socio-professional groups and the corresponding mentality for implementing individual and social life strategies based on the accentuation of the deployment of individual components of nature and a person's psyche by targeted and indirect influence of the social and information space on an individual's consciousness, lifestyle and activity, value orientations and the civic position". He notes that a personality's social formation can be determined by three groups of factors: natural, sociocultural and individual-personal. Natural factors are the environment in which the individual is located and where the development of his biological, social and spiritual nature (cosmic, biospheric and geographical) takes place. Sociocultural factors are economic, social, political and spiritual ones. They are distributed depending on the level of organization of society at the mega, macro and micro levels. The mega-level includes sociocultural factors: economic, social, political and spiritual processes of the existence of mankind as a whole. The macro level of sociocultural factors includes economic, social, political and spiritual processes of the life of a particular society. The micro-level of sociocultural factors concerns the personlity's living conditions of the individual, the state and characteristics of the professional, social and spiritual processes of life of specific groups (Kryvokon, 2007). In our opinion, it is very useful to study the conditions and experience of prominent scientists' development. Vernadsky's life and scientific path were studied by biographers and historians. In recent years there have been scientific works examining mainly his contribution to science. As for Vernadsky's life, the works of Sytnyk and Bevz (2017) are dedicated to the historical perspective of the outstanding scientist's life and activities. Volkov and Kulikova (2007) consider his legacy in terms of "awakening of the Ukrainian nation". Posokhov (2002) analyzes his views on the "university issue". However, psychological studies of a personality's development, the formation of V. I. Vernadsky's views were not in the focus of scientists' attention. In previous articles we analyzed the phenomenon of V. I. Vernadsky's scientific talent (Vynogradova, 2019). However, it is necessary to study the conditions of V. I. Vernadsky's sociocultural environment which influenced the formation of the scientist's personality and his scientific thought.

The aim of the study. To investigate the main environmental factors that influenced the development of V. I. Vernadsky's personality in his childhood and adolescence.

Materials and Methods

In order to study the conditions for the formation of V. I. Vernadsky's worldview we applied the biographical method. It should be noted that in this study this method is used to determine socio-political factors, family influences, the university environment which were systemic and forming ones for the scientist's views. We focused on the study of the formation of the future scientist's personality in the context of historical events, the features of their individual being and relationships with immediate circle which had a special influence on the formation of life programs and scenarios of the development of V. I. Vernadsky's personality and worldview.

Results

We have made a theoretical and historical analysis of V. Vernadsky's life. The conditions in which young people formed in the 19th century did not differ much from those in which their parents grew up. Sociocultural influences on the personality were quite stable. Parents' experience helped their children. So, the elders' adaptiveness to living conditions helped young people socialize, obtain education, profession and adopt the values of the older generation (Tytarenko, Zlobina, & Liepikhova, 2012).

V. Vernadsky had glorious ancestors who were devoted to Motherland and fought in B. Khmelnytsky's host for Ukraine's independence and were in Zaporizhzhya Sich. The Vernadsky family lead their genealogy from Ivan Nykyforovych Vernadsky (1729–1732 birth year – 1813 death year). After the liquidation of the Zaporizhzhya Sich, he moved to Chernihiv province governorate. There he was elected a priest in a large village of Tserkovshchyna, Berezhansky district in Chernihiv governorate. V. Vernadsky wrote such lines about his great-grandfather: "He was a proud man, rather well-educated ... however, he was a notorious despot both in the family and in relations with others" (Vernadsky, 1988a, p. 18). This was clearly manifested in relation to his son (V. I. Vernadsky's grandfather) whom he wanted to force to become a priest or a military man. Grandfather, Vasyl Ivanovych Vernadsky, was a modest man and sought to become a doctor. For his dream he fled from home and came on foot to university in Moscow. There he wandered heavily for some time without money but subsequently made his way. Vasyl Ivanovych graduated from Moscow Military Medical Academy, received the title of military doctor. He also went through a large number of military campaigns in the armies of Suvorov and Kutuzov. During the war with Napoleon he was captured, and this had significant influence on him. However, he treated both Russians and French in the hospital. For his humane attitude to patients of various nationalities Napoleon Bonaparte awarded Vasyl Ivanovych the Order of the Legion of Honor of an officer degree (Sytnik & Bevz, 2017, p. 11). Kateryna Yakivna (wife of Vasyl Ivanovych) was with her husband in military campaigns. V. Vernadsky wrote about her: "Grandmother is Korolenko, she is from a great family full of intellectual interests – like ours – not from the Cossack leaders but from the serving nobility" (Vernadsky, 2010). So, on his grandmother's side Volodymyr Vernadsky was a relative of the writer Korolenko.

After the war Vasyl Vernadsky lived in Kyiv where he led an active life. He was a member of the circle of Masons whose head was Pilecki. The main idea professed by the members of the Order of Masons was the dream of creating a single human community: "The whole world is one big Republic." The main Masonic slogan was: "Freedom, Equality, Brotherhood." At the beginning of the XIX century Masonic lodges operated in Kyiv, Zhytomyr, Odesa, Kharkiv, Poltava and Lviv. Their members were representatives of the intelligentsia: doctors, architects, writers, merchants and representatives of senior-gentry families (Arkas, 2008). The ideas of the Slavic Federation, in which Ukrainians would be equal among equals, were spread among Ukrainian Masons. Also known was Kyiv "Lodge of the United Slavs" which existed in 1818–1822. However, in 1822 the government prohibited the activities of Masonic lodges, and their members were persecuted. Also a member of this society was a close friend of Volodymyr Vernadsky's grandfather and grandmother – Dr. Christian Bunge. He was the father of the Minister of Finance and later a member of the State Council. It should be noted that Freemasonry also influenced Volodymyr Vernadsky's father (Sytnik & Bevz, 2017).

Father Ivan Vasylyovych (1821–1884) was born in Kyiv. He graduated from the University of St. Volodymyr where he later became a professor of political economy and statistics, had a doctoral degree in historical sciences (see Figure 1).

Figure 1. Ivan Vasylyovych Vernadsky (1821–1884), father.

Ivan Vernadsky believed that political economy had, first of all, to study human needs and means of satisfying them. He divided all needs into two parts: the desire for self-preservation and for improvement. The struggle of these two needs creates, from Ivan Vernadsky's point of view, a human person. Undoubtedly these views had a great influence on the development of the personality of his son Volodymyr.

Ivan Vernadsky was actively engaged in scientific and social activities. It should be noted that he belonged to a cohort of progressively thinking intelligentsia. He was fluent in several European languages, highly valued culture and science. He was a supporter of the introduction of democratic constitutional rule in the country. Five years before the abolition of serfdom, he gave free to his peasants (Vynohradova, 2020). In 1861, Vernadsky opposed landlord tenure and agrarianization of the Russian Empire and the concept of "communal socialism" by Mykola Chernyshevsky. A controversy developed between them on the pages of the Sovremennik and Economichny Pokazhchyk magazines (Sytnik & Bevz, 2017).

The first wife of Ivan Vasylyovych was Mariya Mykolayivna Shygayeva, the daughter of the famous Russian economist Mykola Shygayev. She was the first female economist in Russia and quite actively defended women's rights. According to the memoirs of contemporaries, she was an intelligent woman and had a great influence on her husband. However, she died at a young age from an illness. They had son Mykola.

The mother of Volodymyr Ivanovych, Anna Petrivna Konstantynovych (1837–1898), was a cousin of Mariya Mykolayivna and also came from a senior noble family (see Figure 2).

Figure 2. Anna Petrivna Vernadska (1837–1898), mother.

Vernadsky (1988b, p. 22) wrote: "My mother was born in Kyiv in a landowner's family which already consisted almost exclusively of the military. Her father, an artillery general, was a serviceman but he was a good man, judging by the stories, an original type of the old Ukrainian Cossacks (he spoke mainly Ukrainian)". Anna Petrivna studied at Kyiv General Levashov private boarding school and dreamed of becoming a singer. However, her mother was against it. After a while her father died and she had to work as a class mistress at the Institute of Noble Maidens. Vernadsky (1988b, p. 22) recalled his mother: "In early years my mother was a daring girl. After her father's death she decided to sustain herself and entered an institute in Moscow as a class mistress. There she did not work long. Having great musical abilities and an extremely strong voice, she sought to perform on stage, but her mother opposed this. Subsequently she came to Petersburg, where she also gave lessons and participated in the famous choir of composer Balakirev ...". The family of Anna Petrivna also had Polish roots. V. Vernadsky believed that parents in their families felt the enormous influence of Polish culture. This was seen in observance of the customs of the holidays of Right-Bank Ukraine which were followed by the mother of Volodymyr Ivanovych, in Polish dishes prepared by grandmother (Onyshchenko, 2011).

Vernadsky (1988b, p. 22) described in detail the events with prominent figures of that time. In particular, he noticed that his mother's uncle, Gulak, was a member and "one of the leaders of the secret Ukrainian society – Cyril and Methodius, headed by Shevchenko, Kostomarov and others".

Volodymyr Vernadsky was born in 1863 in St. Petersburg. At this period the leading figures of the Cyril and Methodius Society returned from exile and continued their national activities in the cultural and educational movement. In the 60s in Kyiv, Kharkiv, Poltava and other cities the liberal and democratic intelligentsia began to unite in amateur semi-legal organizations called communities. The community did not have specific programs and charters. All of them were united by the national Ukrainian idea on a democratic basis.

Five years later the Vernadsky family moved to Kharkiv. This environment influenced the young Volodymyr and the formation of his worldview. Ivan Vernadsky (Volodymyr's father) maintained relations with prominent figures of Ukrainian and Russian culture, representatives of democratic thought, namely with Shevchenko, Granovsky, Lavrov, Kavelin, Solovyov, Bunge, Maksymovych and others. During this period, the Vernadskys were often visited by Professor of Kharkiv University Kachenovsky (1827–1872) who was a lawyer, historian, friend of the Vernadsky family, and by writer Alchevska. In his diary, Volodymyr Ivanovych recalled an interesting incident that occurred at their home: "Father and Kachenovsky ... talked about the Garibaldians and the Franco-German war which I was interested in. Suddenly my father called me and told Kachenovsky: "My father thought that I would live to see the constitution, but I don't think so, but I'm sure that Volodya will live in a free country" (Vernadsky, 2010, p. 247).

Volodymyr Ivanovych spent almost eight years in Kharkiv (1868–1876). During these very years that V. Vernadsky's attraction to Ukrainian culture developed. Ukrainian song sunk into his child soul. "My father loved Ukrainian songs very much, and my mother sang them beautifully." Anna Petrivna Vernadska had a wonderful mezzo-soprano. In Kharkiv, according to the memoirs of Volodymyr Ivanovych, "she organized choirs, windows opened and beautiful Ukrainian songs were heard" (Vernadsky, 1922). In 1873, when Volodymyr was ten years old, he entered the first grade of the First Male Kharkiv Gymnasium (see Figure 3, 4). He studied there for two years, although he did not like studying.

Figure 3. Volodymyr Vernadsky – gymnasium pupil.

Figure 4. The former building of the First Gymnasium in Kharkiv.

In 1876, after the family moved to St. Petersburg, Volodymyr entered the third grade of the gymnasium. And in 1881 he finishes it the ninth in the outstanding graduation. Among the graduates of the gymnasium were Professor Krasnov, physicist Tyurin and others. But there were sad circumstances: six months before thegraduation his father suffered a second stroke and he gradually faded away. During the last six months Volodymyr Ivanovych did not attend gymnasium because he took care of his father together with his mother. Despite this, the same year he entered St. Petersburg University.

Teaching scientists inspired him deeply, and at the beginning of his career he decided to devote his research to subjects of soil science, mineralogy, crystallography and general philosophy – dealing with the problems of natural sciences and the humanities. From the third year V. Vernadsky specialized in crystallography and mineralogy and was influenced by Mendeleev who taught inorganic chemistry (Gumilevskij, 1967, p. 29).

However, no matter how significant was the influence of individual courses, lecturers, interesting conversations, casual encounters, a real teacher of V. Vernadsky and a leader for the whole life became the founder of a completely new science in soil science, the original thinker Vasyl Vasylyovych Dokuchaev (Gumilevskij, 1967, p. 30).

Dokuchaev taught mineralogy at the university. He was distinguished by the breadth of scientific interests, the ability to generalize various materials. He had a well-developed ability to observe thanks to which he understood the nature. "During his explanations the dead and silent relief suddenly came to life and gave numerous and clear indications of the genesis and nature of the geological processes taking place in its hidden depths," Vernadsky wrote (Balandin, 1979, p. 14).

Dealing with the problems of the natural and human sciences, starting from the third year V. Vernadsky specialized in crystallography and mineralogy and was influenced by Mendeleev who taught inorganic chemistry (Gumilevskij, 1967, p. 29).

V. Vernadsky took an active citizenship, participated in student unrest in 1882, he was elected to student scientific and public organizations. Together with F. and S. Oldenburgs, Grevs, Krasnov, Shakhovsky and others he created a liberal orientation circle of the Priyutino Brotherhood. Like some other members of the circle, V. Vernadsky strove for public education, collaborated in the Posrednik publishing house, in the St. Petersburg Literacy Committee.

Having entered the society, V. Vernadsky got the opportunity to communicate with future scientists, representatives of various sciences. There Vernadsky met Shevyrev, Lukashevych, Vodovozov, Ulyanov. In the circle for the study of literature for the people he developed a strong friendship with Krasnov, S. and F. Oldenburg, Shakhovsky, Kornilov, Grevs and others (see Figure 5).

Figure 5. From left to right are: Dmitry Shakhovskoy, Andrey Krasnov, Sergey Kryzhanovsky, Fedor Oldenburg. In the middle row: Mikhail Kharlamov, Nikolai Ushinsky, Vladimir Vernadsky. Lying: Alexander Kornilov, Sergey Oldenburg, Alexander Obolyaninov.

The characteristics that S. Oldenburg provided to each member of the circle are interesting: "Shakhovsky is the smartest; Vernadsky is the most talented. Fedir Oldenburg is the kindest and the most affectious. Complementing each other, the three of them would constitute a triune creature – Shakhverburg. They were linked by friendly, fraternal relations for a long time and considered these relations to be vital. Throughout their lives, the fraternity members maintained relationships which were continued by their children" (Sytnik & Bevz, 2017, p. 34). In this circle V. Vernadsky met his future wife Starytska. The society united talented youth on the basis of decency, honesty and mutual assistance. That is, the brotherhood also had a social orientation: "… first of all, they were worried about the search for a living, specific, common cause that they could do together – immediately, now" (Shakhovskoj, 1992, p. 178).

The fraternity had the following rules:

1. Work as hard as you can.
2. Consume (for yourself) as little as possible.
3. Look at other people's troubles as at your own (Vernadsky, 1988a, pp. 6–7).

The moral principles of the fraternity were formed largely under the influence of the works by Leo Tolstoy, his ideas of goodness and truth. V. Vernadsky sincerely admired Leo Tolstoy's teachings and shared many of his doubts. However, Leo Tolstoy did not believe that science could help man find the "meaning of life", to come to terms with the inevitability of death, to justify high moral principles. It is unlikely that such ideas were close to V. Vernadsky. Unlike Tolstoy, he was convinced of scientific knowledge all his life and strove to find an answer to many questions of being based on a logical analysis of facts and true knowledge about the world and man (Balandin, 1979). V. Vernadsky wrote in his diary: "We had L. N. Tolstoy – we had a long conversation with him about ideas, the science, etc. He said that he was considered a mystic, but he was rather a mystic. And I would be glad to be one but skepticism prevents me from this. I think that Tolstoy's doctrine is much deeper than it seemed to me at the beginning. And this depth was in the following: 1) the basis of life is the search for truth, and 2) the real task is to express this truth without any concessions" (Vernadsky, 1988a, p. 7).

Studying in his second year, V. Vernadsky met officer Pokhitonov and had friendly relations with him. He was a member of the underground military organization Narodna Volya. However, it is not known for sure if Volodymyr Ivanovych knew about this. However, Pokhitonov familiarized Vernadsky with illegal literature. Later, Volodymyr Ivanovych made an entry in his diary about Pokhitonov: "He left an indelible mark on my life and had a great influence on my worldview ... I did not know a better person, deeper mind, kinder heart, and there was no person who had bigger influence on me, excluding my father and uncle E. M. Korolenko who taught his nephew to love to nature" (Mochalov, 1982, p. 33).

Figure 6. Volodymyr Ivanovych Vernadsky.

From the beginning of the 20th century, V. Vernadsky (see Figure 6) occupied a prominent place in the scientific community and political life of Russia. He maintained active scientific and personal ties with scientists around the world. The ideas of Volodymyr Vernadsky played an outstanding role in the formation of a modern scientific picture of the world. At the center of his natural science and philosophical interests is the development of a holistic doctrine of the biosphere, living matter (which creates the Earth's shell) and the evolution of the biosphere into the noosphere in which the human mind and activity, scientific thought become a determining factor in development, a powerful force comparable in its influence on nature with geological processes. Vernadsky's doctrine on the relationship between nature and society influenced the formation of modern environmental consciousness.

Discussion

The growth period of Vernadsky during the second half of the 19th century falls on the time of the intensification of the political consciousness of progressive public figures, the active development of industry, the abolition of serfdom, economic growth, the development of culture, the awakening of Ukrainian national thought, populism, as well as the prohibition of teaching in Ukrainian, printing books in Ukrainian and the authorities' attempts to level Ukrainian national traditions. These factors influenced the progressive strata of the society to which the Vernadsky family belonged.

If we compare the economic and social situation of the family in the 19th century, it depended on which layer of society the family belonged to. The Vernadsky family came from a noble kin. It should be noted that the family is a rather closed circle of people. However, at the same time, it is an integral institution of the life of society. The family influences relations in society, the nature of all processes of social life. V. I. Vernadsky's parents had quite progressive views on the development of society, the economy and the socio-political situation as a whole. So, Volodymyr Vernadsky had the opportunity to get the best education both at home and abroad. Also, the views of the parents influenced the formation of Vernadsky's personality. In the Vernadsky family dominated the cult of the Decembrists and a negative attitude towards autocracy and serfdom. The numerical circle of progressive figures in science, economics, politics, art, etc., influenced the development of the personality of Volodymyr Ivanovych. He was fond of scientific activity but believed that a scientist cannot stand aloof from public life, be outside of it. So, V. Vernadsky, like his father, was actively engaged in scientific and social activities.

In his student years, the outstanding scientists Mendeleev, Dokuchaev and the famous writer Tolstoy had the greatest influence on shaping Vernadsky's views. Also, his teachers, among whom also were outstanding scientists Beketov, Butlerov, Sechenov and others, inspired him to research. Volodymyr Vernadsky inherited a broad scientific approach and high ethical standards.

Thus, we can say that the development of V. I. Vernadsky's personality and views was influenced by his social environment, communication with highly intelligent people in the family, a wide range of communication with prominent personalities while

studying at the university – not only with teachers but also with leading public figures.

So, Vernadsky's life values were formed under the influence of the views of the intelligentsia calling for the transformation of society. During this period, the authority of science was growing in the world, discoveries and their technical embodiments were taking place. Volodymy Ivanovych believed in the destination of science as the main factor in society improvement. He understood that in Russia the development of science was possible only with the support of the state.

Universities as centers of science and development of society today inspire young scientists with a vivid example of the formation of the personality of the outstanding scientist V. Vernadsky and his scientific heritage (Melnyk & Pypenko, 2018).

Further research will consist in the analysis of the interaction of life events, study abroad, scientific practice on the formation of their scientific position and the creation of scientific works.

Conclusions

The article first analyzes the sociocultural conditions of V. I. Vernadsky's personality formation. The development of his personality took place in an aristocratic family with progressive views. From childhood, Volodymyr Ivanovych had the opportunity to immerse himself in the atmosphere of advanced politicians and scientists. That is, the spirit of reform and innovation which was present in the family, also has a considerable influence on the children's upbringing. Of course, these factors developed the future scientist's flexibility of thinking, the courage to take risks in developing new ideas, freedom-loving views and other qualities that contributed to the formation of the future outstanding scientist's personality.

So, we can conclude that from childhood V. Vernadsky was interested in social life of both the whole country and the institutions where he had to study or work. In his children's diaries he chronicled the current gymnasium life as well as national events (for example, trials of revolutionary citizens or the facts of the Russian-Turkish war in the Balkans).

V. I. Vernadsky had the opportunity to shape freedom of thought, critical, creative thinking, both in the family circle and actively participating in social movements, and this influenced the development of his personality and talent. An inspiring example of an authoritative academic staff, their support, a high level of university education and the constant self-education of students – all this provided V. I. Vernadsky's creative talent with a professional orientation.

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ORIGINAL RESEARCH

Resistance to Post-traumatic Stress Reactions of Vulnerable Groups Engaged in Pandemic Liquidation

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Authors' Contribution:
A – Study design;
B – Data collection;
C – Statistical analysis;
D – Data interpretation;
E – Manuscript preparation;
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Abstract

Background and Aim of Study: *The increase in cases of post-traumatic stress reactions among vulnerable groups engaged in the pandemic liquidation, make the problem urgent for nowadays.*
The aim of the study: to reveal the peculiarities of mental traumatic influence on military-men engaged into the COVID-19 pandemic liquidation; detail the level of stress, anxiety and depression in order to develop further actions concerning mental support and psycho-prophylaxis.

Material and Methods: *In order to conduct the research, we have engaged 334 military-men (of different categories: military-men for a regular term and military-men under a contract, officers (of the age from 18 to 40), who performed their duty of maintaining order together with the police. We have shortlisted 3 groups. The structured questionnaire consisted of questions grounded on the following methods: "Mississippi Scale for Estimating Post-Traumatic Reactions (military variant)"; "Depression Anxiety Stress Scales"; "Insomnia Severity Index". Cronbach's alpha is 0.817 (good internal consistency).*

Results: *By the results of using the Mississippi scale for estimating post-traumatic reactions (military variant), the following fact has been stated: among military-men experienced in battle actions, the quantity of people with PTSR indicators accounted for 1.79%, that is significantly less than among military-men inexperienced in battle actions (3.42%). We have also revealed some certain gender peculiarities.*

Conclusions: *Military-men experienced in battle actions display anxiety, depression, stress and sleep disorders considerably more rarely than military-men inexperienced in such. In our mind it is stipulated by the fact that committing professional duties in conditions of the COVID-19 pandemic is less stressful for military-men experienced in battle actions than the battle actions themselves which they are adapted to. Sleep disorders (the average point by "Insomnia Severity Index" methods) have been considerably higher among military-women, than among military-men in all the groups that is connected, with their higher extraversion and stress in the COVID-19 pandemic.*

Keywords: *pandemic, anxiety, depression, stress, military-men, COVID-19*

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Introduction

The COVID-19 pandemic has led to expansion of problems concerning mental health. This problem has been revealed by researchers in medical, psychological, and social fields. Their studies prove that the situation with the COVID-19 has provoked an increase in cases of post-traumatic stress reactions and post-traumatic stress disorders, of vulnerable groups in particular (Holmes et al., 2020). Medical staff is one of the risk groups, which has a high possibility of psychological problems. Medical workers are affected by such psychological factors as mental over-loading, danger to be personally infected and become a reason of infecting members of their own family, etc. (Johns Hopkins University, Coronavirus Resource Center, 2020).

However, besides medical staff, a significant role in overcoming the consequences of the pandemic is played by military-men of the National Guard and policemen who maintain order among the population during the quarantine period. In Ukraine they perform the following functions: enforce civil order in places of the quarantine regime and observation, control the population to follow restricting quarantine actions by keeping up a patrol, etc. Policemen and military-men are engaged in solving conflicts with the people who refuse to follow the quarantine requirements. Committing functional duties creates a real threat to catch the disease due to a direct contact with those who are infected by the COVID-19.

Moreover, on account of military-men taking part in the operation of joint forces in Donbas that was accompanied by actions of the whole set of factors of battle conditions, a lot of military-men generate the symptoms of post-traumatic stress reactions (PTSR) (Melnyk, Prykhodko, & Stadnik, 2019; Melnyk & Stadnik, 2018). In terms of carrying out official duties at times of the COVID-19 pandemic, this group of military-men is affected by additional stress factors as well. It stipulates the necessity to research vulnerability to post-traumatic stress reactions of military-men who are engaged in the pandemic liquidation, as well as to develop an effective system of preventing neurotic disorders among them.

The aim of the study. To reveal the peculiarities of mental traumatic influence on military-men engaged into the COVID-19 pandemic liquidation; detail the level of stress, anxiety and depression in order to develop further actions concerning mental support and psycho-prophylaxis.

Materials and Methods

In order to conduct the research, we have engaged 334 military-men (of different categories: military-men for a regular term and military-men under a contract, officers (of the age from 18 to 40), who performed their duty of maintaining order together with the police. We have shortlisted 3 groups: Group 1: 112 military members experienced in community policing and battle actions, among them: 96 (85.71%) men and 16 (14.29%) women; Group 2: 117 military members experienced in community policing, but inexperienced in battle actions, among them: 99 (84.62%) men and 18 (15.38%) women; Group 3 (Control): 105 military members inexperienced in community policing as well as any battle actions, among them: 86 (81.90%) men and 19 (18.10%) women.

The study has been realised by such electronic means as on-line messengers: Facebook, Telegram, WhatsApp etc. This form of the on-line questionnaire has arisen from the necessity to restrict group contacts under conditions of the COVID-19 pandemic.

The structured questionnaire consisted of questions grounded on the following methods: “Mississippi Scale for Estimating Post-traumatic Reactions (military variant)”; “Depression Anxiety Stress Scales” (“DASS-21”); “Insomnia Severity Index” (“ISI”).

Besides, military-men who had mental disorders by the results of the standardised psychological methods have been interviewed by psycho-diagnostics with the purpose of specifying symptoms and providing psychological support.

Cronbach’s alpha used to assess the reliability of the structured questionnaire. Cronbach’s alpha is a measure used to assess the reliability, or internal consistency, of a set of scale or test items. In other words, the reliability of any given measurement refers to the extent to which it is a consistent measure of a concept, and Cronbach’s alpha is one way of measuring the strength of that consistency. Using the module SPSS Statistics, Cronbach’s alpha is 0.817. The obtained α value is included in the interval $0.9>\alpha\geq0.8$, indicating a good internal consistency.

Results

To assess the psychological influence of the COVID-19 pandemic on military-men and the level of intensity of their post-traumatic stress reactions we have applied “Mississippi Scale for Estimating Post-traumatic Reactions (military variant)” (Ahaiev et al., 2016). It has been developed to diagnose PTSR by military-men who performed tasks in the zone of battle actions. The Methods have been developed on the grounds of MMPI that consists of 35 questions forming three basic scales, which correlate with three groups of PTSR symptoms: 11 questions of the first scale describe symptoms of the group “invasion”, 11 questions of the second scale describe symptoms of the group “avoidance”, 8 questions of the third scale describe symptoms “excitability”, 5 questions describe symptoms connected with a feeling of blame and suicide inclination. The number of the received points allows dividing those who are under study into the following groups: fewer than 77 points – normative indices; 78-97 points – certain symptoms of PTSR; 98-145 points – indicators of PTSR (Ahaiev et al., 2016).

Further detalisation of psychopathological symptoms has been carried out by “DASS-21” methods. It is a short form of DASS (21 questions), that is intended for measuring negative states of depression, anxiety and stress. Assessment of DASS subscales has been realised according to the standardised methods (Psychology Foundation of Australia, 2018). The average number of points by the scale has been assessed, as well as a

number of military-men with normal, insignificant, moderate, heavy and extremely heavy manifestations. The indicators by the scales "Depression"/"Anxiety"/"Stress" are as follows: normal manifestations: 0-3/0-4/0-7 points, insignificant manifestations: 5-6/4-5/8-9 points, moderate manifestations: 7-10/6-7/10-12 points, heavy manifestations: 11-13/8-9/13-16 points, extremely heavy manifestations: 14+/10+/17+. These methods are appropriate for clinical and non-clinical conditions (Henry & Crawford, 2005). To our mind, its application is expedient for people who have to act under extreme conditions, including the COVID-19 pandemic. Other scientists share the same view (Tan, 2020).

The quality of sleep which indicates whether the respondents have experienced any stress has been evaluated by "ISI" methods (Bastien, Vallières, & Morin, 2001). The given methods are used to assess a subjective level of insomnia which consists of 7 points being estimated by Likert scale from 0 to 4 points. The average rate by "ISI" has been divided into: the absence of clinically significant insomnia (0-7), subliminal insomnia (8-14), moderately heavy clinical insomnia (15-21) and heavy clinical insomnia (22-28).

The estimate results of psychological influence of the COVID-19 pandemic on military-men and the level of manifestations of post-traumatic stress reactions have been revealed by the methods "Mississippi Scale for Estimating Post-traumatic Reactions (military variant)" presented in Table 1.

Table 1. Psychological impact of the epidemic COVID-19 on military members and the severity of post-traumatic stress reactions.

Reactions	Group 1[1]						Group 2[2]						Group 3 (Control)[3]					
	Total		Men		Women		Total		Men		Women		Total		Men		Women	
	N.	%	N.	%	N.	%	N.	%	N.	%	N.	%	N.	%	N.	%	N.	%
Normal	104	92.86	89	92.71	15	93.75	102	87.18	88	88.89	14	77.78	101	96.19	83	96.51	18	94.74
Psychiatric	6	5.36	5	5.21	1	6.25	12	10.26	8	8.08	4	22.22	4	3.81	3	3.49	1	5.26
PTSR	2	1.79	2	2.08	0	0.00	3	2.56	3	3.03	0	0.00	0	0.00	0	0.00	0	0.00

Note. N.: number of military members performed duties of community policing during the epidemic eruption of COVID-19; % percentage value;
[1]Group 1: military members who had experience of community policing and some battle experience – 112 people, among them: 96 (85.71%) men and 16 (14.29%) women;
[2]Group 2: military members who had experience of community policing, but did not have any battle experience – 117 people, among them: 99 (84.62%) men and 18 (15.38%) women;
[3]Group 3 (Control): military members who did not have experience of community policing as well as any battle experience – 105 people, among them: 86 (81.90%) men and 19 (18.10%) women.

By the results of using the "Mississippi Scale for Estimating Post-traumatic Reactions (military variant)", the following fact has been stated: among military-men experienced in battle actions, the quantity of people with PTSR indicators accounted for 1.79%, that is significantly less than among military-men inexperienced in battle actions (2.56%). Also among the military-men of Group 1, certain PTSR symptoms have been revealed in 5.36% cases, that is nearly twice as less as among the military-men of Group 2 (10.26%). Control Group has shown certain PTSR symptoms in 3.81% of cases.

Psychological impact of the epidemic COVID-19 on military members and the severity of PTSR is shown in percentage in Figure 1.

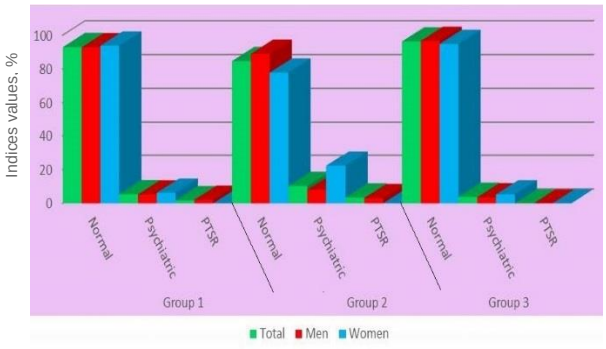

Figure 1. Psychological impact of the epidemic COVID-19 on military members and the severity of post-traumatic stress reactions.

We have also revealed some certain gender peculiarities. The normative indicators among military-men and women experienced in battle actions are practically equal (92.71% and 93.75% correspondingly). At the same time among military-women inexperienced in battle actions, the quantity of certain PTSR symptoms (77.78%) is fewer than among men inexperienced in such (88.89%).

During a consulting interview with a psychologist, the following PTSR manifestations have been indicated among this category of military-men: a loss of appetite, fast fatigability, worsening of physical state, sleep disorders, anxiety, depression, irritability, inattentiveness, numbness, fear and despair.

Women displayed complaints for a feeling of personal weakness, helplessness, disorientation, fear as for their own physical health, freight, disappointment, paranoid ideas as for the COVID-19 pandemic, while men manifested a loss of control over the situation, irritability, aggressive behaviour and excessive optimism.

Using the module SPSS Statistics, the contingency table (cross-tabulation, crosstab) is based on two variables: according to the list of rows (group) and according to the list of columns (reaction). The value in each cell of the table is the count (frequency). The table displays the observed and expected frequencies (counts), their deviation (residual) in absolute units, frequency values in relation to the sums of rows, columns and the total in relative units (percentage of group, percentage of reaction, percentage of total).

Cross-tabulation for the methods "Mississippi Scale for Estimating Post-traumatic Reactions (military variant)" is presented as Table A.

Further detalisation of PTSR symptoms has been conducted by "DASS-21" and "ISI" methods. Manifestations of depression, anxiety and stress among military-men who performed duties of maintaining civil order during the COVID-19 pandemic, is given in Table 2.

Table 2. Manifestations of depression, anxiety and stress among military members who performed duties of community policing during the pandemic COVID-19.

Indicators	Group 1[1]						Group 2[2]						Group 3 (Control)[3]					
	Total		Men		Women		Total		Men		Women		Total		Men		Women	
	N.	%	N.	%	N.	%	N.	%	N.	%	N.	%	N.	%	N.	%	N.	%
Mean DASS-21 Anxiety score	2.54		2.43		3.19		2.97		2.73		4.28		2.17		2.10		2.47	
Normal	103	91.96	90	93.75	13	81.25	98	83.76	86	86.87	12	66.67	101	96.19	84	97.67	17	89.47
Mild	3	2.68	2	2.08	1	6.25	9	7.69	7	7.07	2	11.11	2	1.90	1	1.16	1	5.26
Moderate	3	2.68	2	2.08	1	6.25	5	4.27	3	3.03	2	11.11	2	1.90	1	1.16	1	5.26
Severe	2	1.79	1	1.04	1	6.25	3	2.56	2	2.02	1	5.56	0	0.00	0	0.00	0	0.00
Extrem. Severe	1	0.89	1	1.04	0	0.00	2	1.71	1	1.01	1	5.56	0	0.00	0	0.00	0	0.00
Mean DASS-21 Depression score	2.26		2.33		2.50		2.88		2.63		4.28		2.17		2.14		2.47	
Normal	104	92.86	90	93.75	14	87.50	99	84.62	87	87.88	12	66.67	100	95.24	83	96.51	17	89.47
Mild	3	2.68	2	2.08	1	6.25	9	7.69	7	7.07	2	11.11	3	2.86	2	2.33	1	5.26
Moderate	3	2.68	2	2.08	1	6.25	5	4.27	3	3.03	2	11.11	2	1.90	1	1.16	1	5.26
Severe	1	0.89	1	1.04	0	0.00	2	1.71	1	1.01	1	5.56	0	0.00	0	0.00	0	0.00
Extrem. Severe	1	0.89	1	1.04	0	0.00	2	1.71	1	1.01	1	5.56	0	0.00	0	0.00	0	0.00
Mean DASS-21 Stress score	4.26		4.53		4.00		4.97		5.15		4.22		4.25		4.17		4.00	
Normal	105	93.75	89	92.71	16	100.00	100	85.47	84	84.85	17	94.44	102	97.14	83	96.51	19	100.00
Mild	3	2.68	3	3.13	0	0.00	9	7.69	8	8.08	1	5.56	2	1.90	2	2.33	0	0.00
Moderate	2	1.79	2	2.08	0	0.00	4	3.42	4	4.04	0	0.00	1	0.95	1	1.16	0	0.00
Severe	1	0.89	1	1.04	0	0.00	2	1.71	2	2.02	0	0.00	0	0.00	0	0.00	0	0.00
Extrem. Severe	1	0.89	1	1.04	0	0.00	2	1.71	2	2.02	0	0.00	0	0.00	0	0.00	0	0.00

Note. N.: number of military members performed duties of community policing during the epidemic eruption of COVID-19; % percentage value;
[1]Group 1: military members who had experience of community policing and some battle experience – 112 people, among them: 96 (85.71%) men and 16 (14.29%) women;
[2]Group 2: military members who had experience of community policing, but did not have any battle experience – 117 people, among them: 99 (84.62%) men and 18 (15.38%) women;
[3]Group 3 (Control): military members who did not have experience of community policing as well as any battle experience – 105 people, among them: 86 (81.90%) men and 19 (18.10%) women.

On the basis of questioning by "DASS-21" methods we have revealed the following qualitative results by the scale "Anxiety" for Group 1 of those who are under study: absence of anxiety symptoms has been indicated by 91.96% of military-men, insignificant and moderate manifestations of anxiety have been revealed by 2.68% of people, heavy ones – by 1.79% of people, and a critical level of anxiety has been indicated only by 1 (0.89%) of military-men. Group 2 consisting of those who are under research by the scale "Anxiety" has manifested the following indices: absence of anxious symptoms has been indicated by 83.76% of military-men, insignificant ones – by 7.69%, moderate – by 4.27%, heavy manifestations of anxiety have been noticed by 2.56% of people, and excessively heavy manifestations of anxiety have been revealed by 1.71% of military-men. Control Group has shown insignificant indices by the "Anxiety" scale: only 2 (1.90%) of people have revealed insignificant and moderate manifestations of anxiety. An average point by the scale "Anxiety" for Group 1 has made 2.54 which is less than the indices for Group 2 (2.97) and Control Group (2.17). It should be noted that the average point by the "Anxiety" scale for military-women has constituted 1.3-1.5 times as much than military-men and has made 3.19 and 4.28 points for Groups 1 and 2 correspondingly.

Manifestations of depressions among military members who performed duties of community policing during the pandemic COVID-19 are shown in percentage in Figure 2.

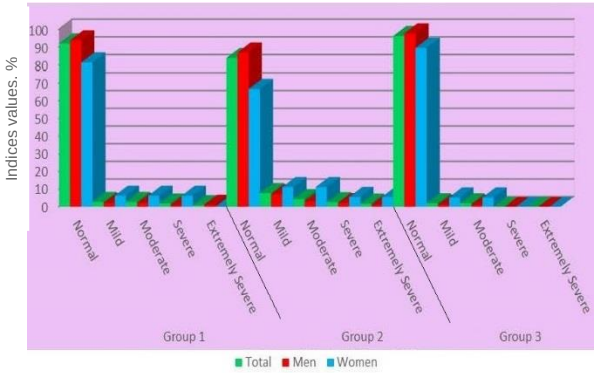

Figure 2. Manifestations of depressions among military members who performed duties of community policing during the pandemic COVID-19.

By the scale "Depression" the absence of depressive symptoms has been noticed by 92.86% of military-men of Group 1, 84.62% of Group 2 and 95.24% of military-men of Control Group. Insignificant manifestations of depression have been indicated by 2.68% of people of Group 1, 7.69% of Group 2 and 2.86% of military-men of Control Group. Moderate manifestations of depression by people of Group 1 have made 2.68% that is significantly less than by Group 2 (4.27%) and Control Group (1.90%) of military-men. Heavy and extremely heavy manifestations of depression have been shown by 0.89% of military-men experienced in battle actions, which is much lower than indicators of military-men inexperienced in such (1.71%).

Manifestations of anxiety among military members who performed duties of community policing during the pandemic COVID-19 are shown in percentage in Figure 3.

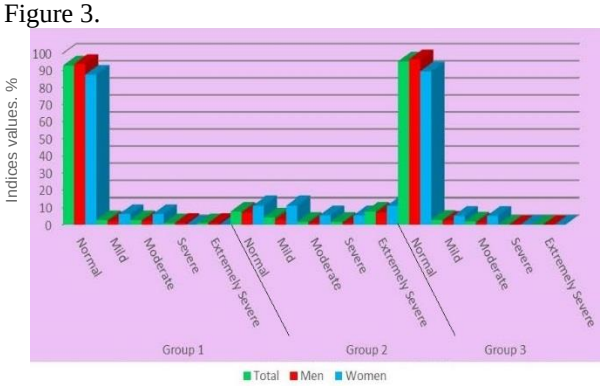

Figure 3. Manifestations of anxiety among military members who performed duties of community policing during the pandemic COVID-19.

An average point by the scale "Depression" for Group 1 comprised 2.26 points that is a little lower, than the indices for Group 2 (2.88) and Control Group (2.17). By the scale "Depression" the average point among military-women, inexperienced in battle actions, has been 1.6 times more than the indices of military-men of the same group. At the same time the indices of the average point by the scale "Depression" for military-women and men inexperienced in battle actions has not differed considerably (2.50 and 2.33 points correspondingly).

The average point by the scale "Stress" for Group 1 has made 4.26 that is a little lower of the indices for Group 2 (4.97) and equals to the average point of military-men of Control Group (4.25). For all this, the average point of military-men experienced in battle actions is the highest (5.15 points) among all gender groups of those who are under study.

The indices of the research DASS-21 by the scale "Stress" for Group 1 are the following: absence of stress symptoms has been noticed by 93.75% of military-men; insignificant manifestations of stress have been indicated only by 2.68% of people; moderate manifestations – by 1.79% of people; heavy and extremely heavy manifestations have been shown by 0.89% of military-men. For military-men inexperienced in battle actions, the indices of "DASS-21" research by the scale "Stress" have been higher: insignificant manifestations of stress have been noticed by 7.69% of people, moderate manifestations – by 3.42% of people, heavy and extremely heavy – by 1.71% of military-men.

Manifestations of stress among military members who performed duties of community policing during the pandemic COVID-19 are shown in percentage in Figure 4.

So, it has to be stated that among military-men experienced in battle actions, a number of people with indicators of evident stress and marked anxious and depressive symptoms is significantly lower than the quantity of military-men with similar symptoms inexperienced in any battle actions. In our opinion it is connected with the fact that performing duties in conditions of the COVID-19 pandemic is less stressful than battle actions themselves for military-men.

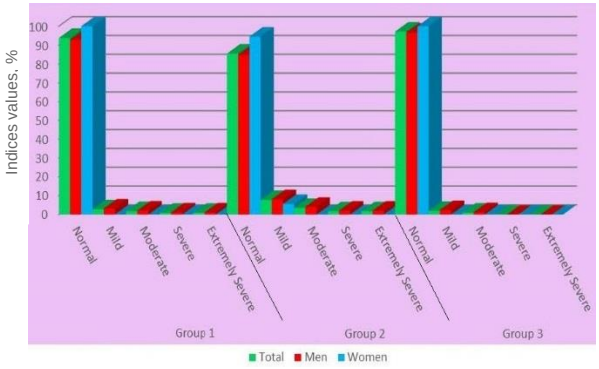

Figure 4. Manifestations of stress among military members who performed duties of community policing during the pandemic COVID-19.

This category of military-men has indicted not only a pessimistic way of thinking, self-depreciation in case of failure, exaggeration of drawbacks and diminishing personal dignity, selective attention to negative sides of nowadays reality, hypertrophic perception of personal responsibility, suicide ideas, but also a so-called "cognitive triad": negative self-perception; negative perception of their past and present; negative perception of future as joyless and dull.

For all this the highest indices of the average point among military-women by the scale "Anxiety" and "Depression" have been revealed by women inexperienced in battle actions, while the average point among military-men inexperienced in battle actions by the scale "Stress" is the highest (5.15 points) among all gender groups of those who are under research.

Cross-tabulation for the methods "The Depression Anxiety Stress Scales" is presented as Table B.

Manifestations of sleep disorders among military-men, who committed their duty of maintaining public order during the COVID-19 pandemic, have been presented in Table 3.

Studying sleep disorders among military-men who committed their duty of maintaining public order during the COVID-19 pandemic, by "ISI" methods have shown that in Group 1 of those who are under research: absence of symptoms of clinically significant insomnia has been observed by 87.50% of military-men, subthreshold insomnia has been stated by 10.71% of people, moderately severe clinical insomnia – only by 1.79% of people. We have not revealed any severe clinical insomnia.

Among military-men of Group 2 the absence of insomnia symptoms has been revealed by 75.21% of military-men, subthreshold insomnia has been observed by 19.66% of people, moderately severe clinical insomnia has been revealed by 3.42% of military-men, while severe clinical insomnia – by 1.71% of military-men. Control Group has shown insignificant indices by "ISI" methods: 95.24% have not given any sign of clinically significant insomnia, 3.81% of military-men have stated subthreshold insomnia, and only 0.95% of people have indicated severe clinical insomnia.

Manifestations of sleep disorders among military members who performed duties of community policing during the pandemic COVID-19 are shown in percentage in Figure 5.

Table 3. Manifestations of sleep disorders among military members who performed duties of community policing during the pandemic COVID-19.

Indicators	Group 1[1]						Group 2[2]						Group 3 (Control)[3]					
	Total		Men		Women		Total		Men		Women		Total		Men		Women	
	N.	%	N.	%	N.	%	N.	%	N.	%	N.	%	N.	%	N.	%	N.	%
Mean ISI score	5.62		5.76		6.56		6.97		6.62		8.89		5.35		5.21		6.00	
No clinically significant insomnia	98	87.50	85	88.54	13	81.25	88	75.21	77	77.78	11	61.11	100	95.24	83	96.51	17	89.47
Subthreshold insomnia	12	10.71	10	10.42	2	12.50	23	19.66	19	19.19	4	22.22	4	3.81	3	3.49	1	5.26
Moderately severe clinical insomnia	2	1.79	1	1.04	1	6.25	4	3.42	2	2.02	2	11.11	1	0.95	0	0.00	1	5.26
Severe clinical insomnia	0	0.00	0	0.00	0	0.00	2	1.71	1	1.01	1	5.56	0	0.00	0	0.00	0	0.00

Note. N.: number of military members performed duties of community policing during the epidemic eruption of COVID-19; % percentage value;
[1]Group 1: military members who had experience of community policing and some battle experience – 112 people, among them: 96 (85.71%) men and 16 (14.29%) women;
[2]Group 2: military members who had experience of community policing, but did not have any battle experience – 117 people, among them: 99 (84.62%) men and 18 (15.38%) women;
[3]Group 3 (Control): military members who did not have experience of community policing as well as any battle experience – 105 people, among them: 86 (81.90%) men and 19 (18.10%) women.

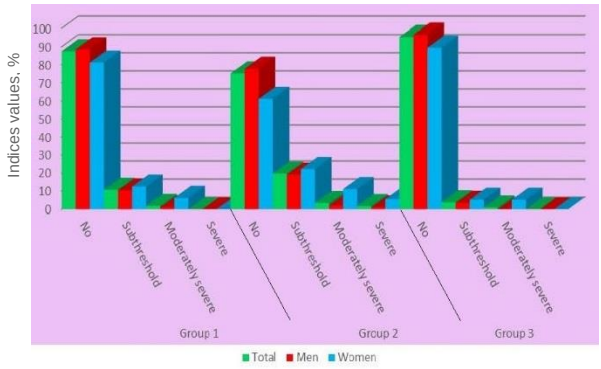

Figure 5. Manifestations of sleep disorders among military members who performed duties of community policing during the pandemic COVID-19.

The average point by "ISI" methods in Group 2 (6.97) exceeded considerably the indices of Group 1 (5.62) and Control Group (5.35), that proves qualitative disorders in the form of shortening the length of night sleep, too late falling asleep, too early waking-up, frequent interruptions of sleep during a night. It should be indicated that the average point by "ISI" methods among the women has been higher in all the groups than among the men (see Figure 6). To our mind it has resulted from a higher level of their extraversion and stress in conditions of the COVID-19 pandemic.

Cross-tabulation for the methods "Insomnia Severity Index" is presented as Table C.

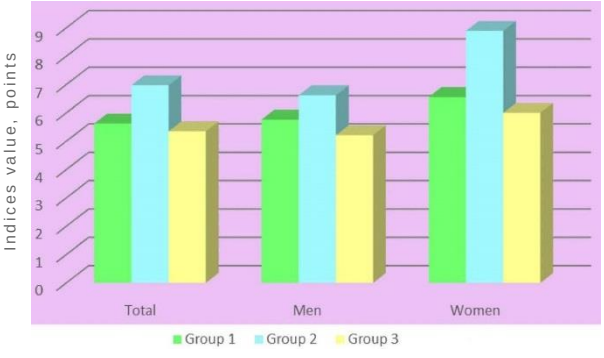

Figure 6. Mean "ISI" score.

Discussion

In Wuhan (Hubei, China) in December, 2019, a severe acute respiratory syndrome of coronavirus (SARS-CoV-2) has been indicated (Dong, Du, & Gardner, 2020; Lauer et al., 2020).

Initially, the new virus was called 2019-nCoV. Subsequently, the task of experts of the International Committee on Taxonomy of Viruses (ICTV) termed it the SARS-CoV-2 virus as it is very similar to the one that caused the SARS outbreak (SARS-CoVs) (Cascella, Rajnik, Cuomo, Dulebohn, & Di Napoli, 2020).

This coronavirus leads to potentially mortal disease called COVID-19 (Rothan & Byrareddy, 2020).

The spread of COVID-19 has acquired a pandemic nature (A. Remuzzi & Remuzzi, 2020).

By now the disease has spread over more than a hundred of countries of the world and has embraced a million of people (Johns Hopkins University, Coronavirus Resource Center, 2020).

Fast spreading, a wide range and consequences have placed this problem to the first place among scientific research.

The COVID-19 pandemic is having a profound effect on all aspects of society, including mental health as well as physical health (Brooks et al., 2020; Holmes et al., 2020; Shigemura, Ursano, Morganstein, Kurosawa, & Benedek; 2020.

The scientific publications emphasis the urgency of collecting high-quality data of the affect of the COVID-19 pandemic on the mental health of the whole population and vulnerable groups in particular. It is emphasised that certain research and recommendations should be developed in order to lessen the consequences of the affect of the COVID-19 pandemic on mental health of vulnerable groups (Holmes et al., 2020).

Managing mental health challenges faced by healthcare workers during the COVID-19 pandemic has been researched (Greenberg, Docherty, Gnanapragasam, & Wessely, 2020), it has been studied in the sphere of education as well (Araújo de Oliveira et al., 2020).

The influence of consequences of the COVID-19 pandemic on mental health in the clinical aspect has

been researched (Fiorillo & Gorwood, 2020), in the psychological aspect (Tan, 2020).

Pandemics are much more dangerous phenomena compared with natural disasters, such as earthquakes or tsunamis (Morganstein & Ursano, 2020), even comparing the pandemic with wars and international mass conflicts. Under such circumstances people can orientate themselves, while in conditions of the pandemic "threat" can be everywhere and it can be even communicated by a person nearby (Kaniasty, 2019).

Among the groups with an extremely high risk to catch the disease can be not only the medical staff that works in departments of first aid and reanimation, but also policemen and military-men who commit their professional duties, work with people who can be infected.

That is why the topic of resistance to post-traumatic stress reactions of vulnerable groups (military-men), engaged into the pandemic liquidation is urgent and is still insufficiently researched by scientists.

It is also necessary to pay attention to the problem concerning stigma and discrimination to infected people or those who can be referred potentially to them. Fighting with social stigma to the infected people and those who commit their professional duties in conditions of the COVID-19 pandemic has to become one of the priorities for specialists in the field of mental health in the nearest months (Fiorillo & Gorwood, 2020).

Social and psychological aspects of stigmatisations of military-men as an interdisciplinary problem, has been studied in (Melnyk, 2019; 2020).

The problem of influence of extreme conditions on mental health of military-men has been researched in (Melnyk & Stadnik, 2018).

The given research indicates the similarity of symptoms and consequences revealed by different groups of military-men who committed their professional duties in various extreme conditions (Melnyk et al., 2019). A high level of correlation between the results of this research allows making an assumption as for possible efficiency of using the model of medical and psychological support of the professional activity (Melnyk et al., 2019) to military-men, who were engaged into liquidation of the COVID-19 pandemic. This model has been tested on military-men who are under various extreme conditions, and it has been applied for estimating the state of mental health, outlining tendencies and providing preventing measures for development of mental disorders.

Conclusions

So authors of the article have researched the resistance to post-traumatic stress reaction of military-men engaged into liquidation of the COVID-19 pandemic.

The military-men who maintained order and observed how the population followed the quarantine requirements, is one of the risk groups as for the psychological influence of the COVID-19 pandemic. They are affected by common psychogenic factors of the pandemic as well as factors of military service.

The results of studying psychological influence of the COVID-19 pandemic on military-men and the level of evidence of post-traumatic stress reactions revealed by the methods "Mississippi Scale for Estimating Post-traumatic Reactions (military variant)", have shown that in the group of military-men experienced in battle actions, who committed their duties of maintaining public order during the pandemic outbreak, manifestations of PTSR symptoms are nearly twice as low as in the group of military-men inexperienced in battle actions. Military-men experienced in battle actions display anxiety, depression, stress and sleep disorders considerably more rarely than military-men inexperienced in such. In our mind it is stipulated by the fact that committing professional duties in conditions of the COVID-19 pandemic is less stressful for military-men experienced in battle actions than the battle actions themselves which they are adapted to.

We have revealed certain gender peculiarities. An average point by the scale "Anxiety" among military-women of Groups 1 and 2 has been indicated as 1.3-1.5 times higher than among military-men. At the same time the indices of the average point by the scale "Depression" for military-women and men experienced in battle actions have not differed considerably. The average point of military-men inexperienced in battle actions, by the scale "Stress" is the highest among all gender groups of those who are under research. Sleep disorders (the average point by "ISI" methods) have been considerably higher among military-women, than among military-men in all the groups that is connected, to our mind, with their higher extraversion and stress in the COVID-19 pandemic.

We consider the perspective of further scientific research in studying effectiveness of implementing the model of medical and psychological support of professional activity (Melnyk et al., 2019), as well as developing on this ground the most efficient events of medical and psychological support and psycho-prophylaxis among vulnerable professional categories engaged in the pandemic liquidation.

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Ethical approval

The study protocol was consistent with the ethical guidelines of the 1975 Declaration of Helsinki as reflected in a prior approval by the Institution's Human Research Committee.

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Table A. Crosstab for the methods "Mississippi Scale for Estimating Post-traumatic Reactions (military variant)".

Group	Indicator	Reaction			Total
		Normal	Psychiatric	PTSR	
Group 1	Count	104	6	2	112
	Expected Count	102.9	7.4	1.7	112.0
	Percentage of Group	92.9	5.4	1.8	100.0
	Percentage of Reaction	33.9	27.3	40.0	33.5
	Percentage of Total	31.1	1.8	0.6	33.5
	Residual	1.1	-1.4	0.3	-
Group 2	Count	102	12	3	117
	Expected Count	107.5	7.7	1.8	117.0
	Percentage of Group	87.2	10.3	2.6	100.0
	Percentage of Reaction	33.2	54.5	60.0	35.0
	Percentage of Total	30.5	3.6	0.9	35.0
	Residual	-5.5	4.3	1.2	-
Group 3	Count	101	4	0	105
	Expected Count	96.5	6.9	1.6	105.0
	Percentage of Group	96.2	3.8	0.0	100.0
	Percentage of Reaction	32.9	18.2	0.0	31.4
	Percentage of Total	30.2	1.2	0.0	31.4
	Residual	4.5	-2.9	-1.6	-
Total	Count	307	22	5	334
	Expected Count	307.0	22.0	5.0	334.0
	Percentage of Group	91.9	6.6	1.5	100.0
	Percentage of Reaction	100.0	100.0	100.0	100.0
	Percentage of Total	91.9	6.6	1.5	100.0

Table B. Crosstab for the methods "The Depression Anxiety Stress Scales".

Group	Indicator	Level					Total
		Normal	Mild	Moderate	Severe	Extremely Severe	
Group 1	Count	103/104/105	3/3/3	3/3/2	2/1/1	1/1/1	112
	Expected Count	101.3/101.6/102.9	4.7/5.0/4.7	3.4/3.4/2.3	1.7/1.0/1.0	1.0/1.0/1.0	112.0
	Percentage of Group	92.0/92.9/93.8	2.7/2.7/2.7	2.7/2.7/1.8	1.8/0.9/0.9	0.9/0.9/0.9	100.0
	Percentage of Level	34.1/34.3/34.2	21.4/20.0/21.4	30.0/30.0/28.6	40.0/33.3/33.3	33.3/33.3/33.3	33.5
	Percentage of Total	30.8/31.1/31.4	0.9/0.9/0.9	0.9/0.9/0.6	0.6/0.3/0.3	0.3/0.3/0.3	33.5
	Residual	1.7/2.4/2.1	-1.7/-2.0/-1.7	-0.4/-0.4/-0.3	0.3/0.0/0.0	0.0/0.0/0.0	-
Group 2	Count	98/99/100	9/9/9	5/5/4	3/2/2	2/2/2	117
	Expected Count	105.8/106.1/107.5	4.9/5.3/4.9	3.5/3.5/2.5	1.8/1.1/1.1	1.1/1.1/1.1	117.0
	Percentage of Group	83.8/84.6/85.5	7.7/7.7/7.7	4.3/4.3/3.4	2.6/1.7/1.7	1.7/1.7/1.7	100.0
	Percentage of Level	32.5/32.7/32.6	64.3/60.0/64.3	50.0/50.0/57.1	60.0/66.7/66.7	66.7/66.7/66.7	35.0
	Percentage of Total	29.3/29.6/29.9	2.7/2.7/2.7	1.5/1.5/1.2	0.9/0.6/0.6	0.6/0.6/0.6	35.0
	Residual	-7.8/-7.1/-7.5	4.1/3.7/4.1	1.5/1.5/1.5	1.2/0.9/0.9	0.9/0.9/0.9	-
Group 3	Count	101/100/102	2/3/2	2/2/1	0/0/0	0/0/0	105
	Expected Count	94.9/95.3/96.5	4.4/4.7/4.4	3.1/3.1/2.2	1.6/0.9/0.9	0.9/0.9/0.9	105.0
	Percentage of Group	96.2/95.2/97.1	1.9/2.9/1.9	1.9/1.9/1.0	0.0/0.0/0.0	0.0/0.0/0.0	100.0
	Percentage of Level	33.4/33.0/33.2	14.3/20.0/14.3	20.0/20.0/14.3	0.0/0.0/0.0	0.0/0.0/0.0	31.4
	Percentage of Total	30.2/29.9/30.5	0.6/0.9/0.6	0.6/0.6/0.3	0.0/0.0/0.0	0.0/0.0/0.0	31.4
	Residual	6.1/4.7/5.5	-2.4/-1.7/-2.4	-1.1/-1.1/-1.2	-1.6/0.9/-0.9	-0.9/0.9/-0.9	-
Total	Count	302/303/307	14/15/14	10/10/7	5/3/3	3/3/3	334
	Expected Count	302.0/303.0/307.0	14.0/15.0/14.0	10.0/10.0/7.0	5.0/3.0/3.0	3.0/3.0/3.0	334.0
	Percentage of Group	90.4/90.7/91.9	4.2/4.5/4.2	3.0/3.0/2.1	1.5/0.9/0.9	0.9/0.9/0.9	100.0
	Percentage of Level	100.0/100.0/100.0	100.0/100.0/100.0	100.0/100.0/100.0	100.0/100.0/100.0	100.0/100.0/100.0	100.0
	Percentage of Total	90.4/90.7/91.9	4.2/4.5/4.2	3.0/3.0/2.1	1.5/0.9/0.9	0.9/0.9/0.9	100.0

Note. Each cell of the crosstab contains three indicator values, as the methods "The Depression Anxiety Stress Scales" contains three scales ("Depression"/"Anxiety"/"Stress").

Table C. Crosstab for the methods "Insomnia Severity Index".

Group	Indicator	Severity of insomnia				Total
		No clinically significant insomnia	Subthreshold insomnia	Moderately severe clinical insomnia	Severe clinical insomnia	
Group 1	Count	98	12	2	0	112
	Expected Count	95.9	13.1	2.3	0.7	112.0
	Percentage of Group	87.5	10.7	1.8	0.0	100.0
	Percentage of Insomnia	34.3	30.8	28.6	0.0	33.5
	Percentage of Total	29.3	3.6	0.6	0.0	33.5
	Residual	2.1	-1.1	-0.3	-0.7	-
Group 2	Count	88	23	4	2	117
	Expected Count	100.2	13.7	2.5	0.7	117.0
	Percentage of Group	75.2	19.7	3.4	1.7	100.0
	Percentage of Insomnia	30.8	59.0	57.1	100.0	35.0
	Percentage of Total	26.3	6.9	1.2	0.6	35.0
	Residual	-12.2	9.3	1.5	1.3	-
Group 3	Count	100	4	1	0	105
	Expected Count	89.9	12.3	2.2	0.6	105.0
	Percentage of Group	95.2	3.8	1.0	0.0	100.0
	Percentage of Insomnia	35.0	10.3	14.3	0.0	31.4
	Percentage of Total	29.9	1.2	0.3	0.0	31.4
	Residual	10.1	-8.3	-1.2	-0.6	-
Total	Count	286	39	7	2	334
	Expected Count	286.0	39.0	7.0	2.0	334.0
	Percentage of Group	85.6	11.7	2.1	0.6	100.0
	Percentage of Insomnia	100.0	100.0	100.0	100.0	100.0
	Percentage of Total	85.6	11.7	2.1	0.6	100.0

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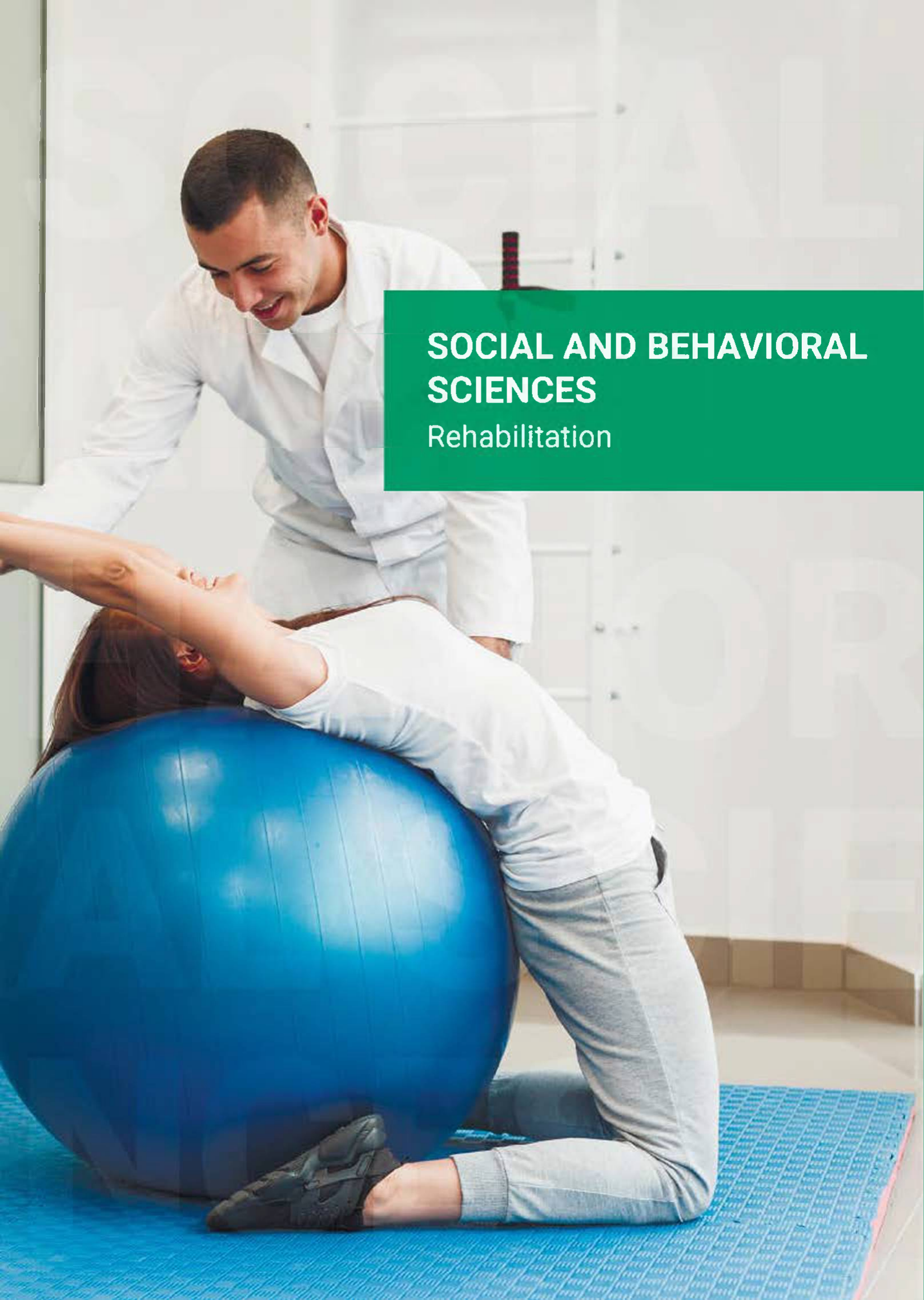

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ORIGINAL RESEARCH

Sensorimotor Criteria for the Formation of the Autonomic Overstrain of the Athletes' Cardiovascular System

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Authors' Contribution:
A – Study design;
B – Data collection;
C – Statistical analysis;
D – Data interpretation;
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G – Funds collection

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Abstract

Background and Aim of Study: *Determination of sensorimotor function is an important area of psychophysiological features study of the athletes' body, which are essential for the analysis of cognitive processes, assessment of the central nervous system functional state, sensory sensitivity, development of motor skills, psychophysiological and neurophysiological parameters of brain.*
The aim of the study: to define the changes of indexes of the central regulation of sensorimotor function of highly skilled sportsmen at forming of the cardiovascular system overstrain.

Material and Methods: *On results research of the cardiovascular system with the use of spiroarteriocardiorhythmography before, after load and a next morning in 19 sportsmen of men, which the overstrains of the cardiovascular system was forming, were determine: at 10 – on a sympathetic type, at 9 – on a parasympathetic type. In parallel was determination of index of switching of central settings (SCS) which received from data of research of the sensorimotor system with the use of device the "Computer motion meter".*

Results: *Right after intensive physical activity the meaningful acceleration of SCSl ($p<0.05$) and meaningful deceleration of SCSr ($p<0.05$) is marked at an overstrain on a sympathetic type, and also meaningful deceleration of SCSl ($p<0.05$) and meaningful acceleration of SCSr ($p<0.01$) at an overstrain on a parasympathetic type. In the period of recovery deceleration of SCSl and SCSr ($p<0.05$) at a sympathetic overstrain, and also stability of index of SCSl by comparison to afterload and meaningful dynamics of SCSr ($p<0.05$) is marked at a parasympathetic overstrain.*

Conclusions: *At a sympathetic and parasympathetic overstrain the characteristic asymmetric changes of indexes of SCS that can testify to the primary flow of ergotrophic and trophotrophic processes in the organism of sportsmen are marked.*

Keywords: *sensorimotor regulating, overstrain of the cardiovascular system, sportsmen, physical load, sympathetic and parasympathetic overstrains*

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Introduction

Determination of sensorimotor function is an important area of psychophysiological features study of the athletes body (Berdychevskaia, Troiskaia, & Fokin, 2009; Craig, 2005), which are essential for the analysis of cognitive processes (Oppenheimer, Gelb, Girvin, & Hachinski, 1992), assessment of the central nervous system (CNS) functional state, sensory sensitivity (Guzii, Romanchuk, & Mahlovanyy, 2020; Noskin et al., 2005), development of motor skills, psychophysiological and neurophysiological parameters of brain functioning (Boloban, 2006; Kuznetsova, Sychov, & Egorova, 2017).

A large number of scientific publications are devoted to the study of simple and complex sensorimotor reactions of athletes, which are aimed at determining the characteristics of the organization of sensorimotor function taking into account the type of sport, gender, training experience, stages of the training process, etc. (Fokin, Boravova, Galkin, Ponomarev, & Shimko, 2009; Mittly, Németh, Berényi, & Mintál, 2016; Shlyk, 2009). However, there is little research into the central mechanisms of athletes' sensorimotor function due to the complexity of using existing methods in the training process (Sorokina, Selitsky, Ilina, & Zherdeva, 2018). First of all, this relates to the methods of studying the activity of the cerebral cortex. Let us point out that among the latter ones is electroencephalography, the method of evoked potentials, positron emission tomography (Craig, 2005). The method of studying the level of constant potential (LCP) has become widespread (Chikurov, Fedorov, Voinich, & Khudik, 2016; Romanchuk, 2003).

An important component of the study of sensorimotor responses is the understanding of the processes that occur at the central level of movement organization, which is related to the mechanisms of intra- and inter-hemispheric interaction. The latter are analyzed taking into account the activity of both hemispheres and determine the level of functional motor asymmetry (Brahina & Dobrohotova, 1988; Pestryaev & Safina, 2014).

It is well known that a modern approach to assessing the interrelation between functional asymmetries and the success of sports activities is linked to an understanding of the dynamic nature of functional interhemispheric interaction. Functional asymmetry is believed to play a regulatory role (Bellenger et al., 2016; Craig, 2005; Guzii, 2019). It provides coordinate presetting of unilateral motor actions. The latter suggests that motor asymmetry is a prerequisite for enhancing the organism's capacity under spatio-temporal conditions of existence (Grabinenko & Zhurba, 2017). Under these conditions, the distribution of functions between the hemispheres of the brain, not being absolute, forms a moving, flexible profile of the hemispheric asymmetry of the brain, the range of adaptive functions of the hemispheric interactions and the dynamics of the main nervous, humoral and immune processes, on which the effectiveness of adaptation to sports activity depends. In this aspect, according to most authors (Crollen, Albouy, Lepore, & Collignon, 2017), the most promising is the study of the dynamics of functional asymmetries in competitive activities and in the process of individual training of athletes at different stages of preparation, which necessitated our study.

Let us remind that the general structural scheme of the organization of sensorimotor processes is a reflex ring (Nicolas, Vacher, Martinent, & Mourot, 2019; Pankova & Karganov, 2013). Sensory information coming from analyzers initiates regulates and controls movements. Coordination of sensory and motor components of the motor act is the most important condition for the functioning of sensory systems (Herpin et al., 2010; Skyba, Pshenychna, & Ustymenko-Kosorich, 2017; Thayer, Yamamoto, & Brosschot, 2010). Sensorimotor reactions are first of all characterized by such psychophysiological concept as "reaction time" (the term is habitually understood as the time interval between the appearance of a signal and the reaction of a response).

This is a complex formation, which is determined by the sum total of the following elements (Bezrukikh et al., 2000):

- the rate of excitation of the receptor and the transmission of the impulse to the appropriate center of sensitivity;
- the speed of signal processing in the CNS;
- the speed of deciding to respond to a signal;
- the speed of signal transmission before the start of action on the efferent fibers;
- the rate at which the excitation of the muscle develops and the inertia of the body or its individual part is overcome.

The reproduction of all these methods in the practice of rapid diagnostics of the basic properties of the nervous system of the person is either completely excluded or extremely time consuming, so for many years there have been searches for fairly simple, but objective tests to determine the basic properties of the CNS: the strength and functional mobility of the nervous processes, balance of excitation-braking activities (Pankova, 2003).

Among the components of the "reaction time", the parameter characterizing the central level of organization of movements is the speed of processing information in the CNS with the decision to respond to a signal.

That is why our attention was drawn to the method of estimating the sensorimotor function using the "Computer Motion Meter" (CMM-03), which is distinguished by the indicator of switching central settings (SCS), which characterizes the central level of regulation of movements, namely the time of decision about changing the characteristics of motion (Guzii et al., 2020; Korobeynikov & Korobeynikova, 2014).

The aim of the study. To determine changes in the indicators of the central regulation of the sensorimotor function of highly skilled athletes in formation of the cardiovascular system overstrain.

Materials and Methods

The algorithm of our study involved the study of parameters and indicators that define the changes of the sensorimotor and cardiorespiratory systems under the

influence of intense physical activity, as well as during the recovery period. The computer motion meter (CMM) was used to investigate the sensorimotor system (Noskin et al., 2005; Pivovarov, 2006). The study of the cardiorespiratory system was performed using the "Spiroarteriocardioritmograf" (SACR) (Guzii & Romanchuk, 2018; Noskin et al., 2005) before examination of the sensorimotor system. The tests were performed before exercise (S_1), immediately after exercise (S_2), and the next after exercise (S_3) morning (stages of the study).

According to this algorithm, 202 highly skilled male athletes aged 22.6±2.8 years were studied using CMM and SACR. Experience in sports was 10.3±3.1 years. In our study, highly skilled athletes of acyclic sports (karate, taekwondo, kickboxing, boxing, water polo, football) participated under the impact of various intense physical activities, which were performed in the preparatory, pre-competitive and competitive periods of the annual training cycle. According to the results of the SACR, 19 athletes were identified with observed changes according to HRV measurements, which indicated the development of cardiovascular system overstrain (Guzii, 2019).

The determination of overstrain was based on the evaluation of changes in autonomic regulation of cardiac rhythm, which was suggested by Shlyck (2009) and considered the stress index as well as ANS activity in the very low frequency diapason (VLF). In general, there are 4 types of autonomous regulation of heart rate (Figure 1).

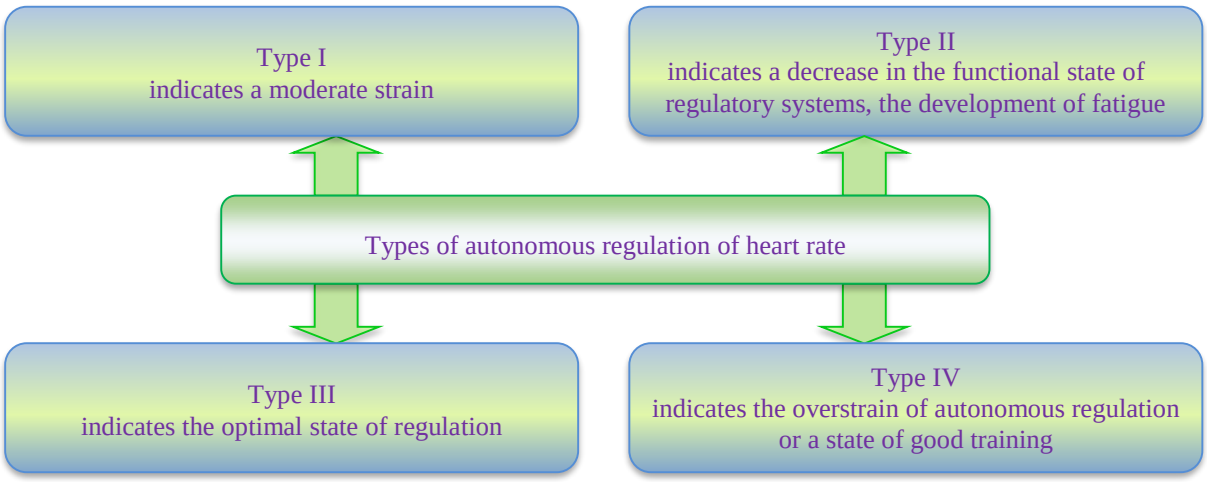

Figure 1. Types of autonomous regulation of heart rate.

Determining the type of autonomic regulation of cardiac rhythm at each stage of the study (S_1, S_2 and S_3) allowed us to establish characteristic changes of types under the influence of intense physical load (Guzii, 2019). At the same time, variants that characterized the activity of the sympathetic and parasympathetic branches of regulation were fixed in the dynamics of observations. We have assigned the following options:

- option 1: with the initial optimal state of the regulatory systems, or the overstrain of autonomous regulation (III and IV type); after intensive training load – reduction of the functional state of the regulatory systems (type II); on the next after training morning – a decrease in the functional state of regulatory systems (type II). Such variant was registered in 10 cases and characterized the development of overstrain of the cardiovascular system by sympathetic type;
- option 2: with initial overstrain of autonomous regulation (type IV); after intensive training load – optimal state of regulatory systems, or overstrain of autonomous regulation (III and IV types); the next morning after training – overstrain of autonomous regulation (type IV). This variant was registered in 9 cases and characterized the development of the cardiovascular system overstrain by parasympathetic type.

According to the results of the selection, we formed 2 observation groups: OG1 consisted of 10 athletes, who were noted into overstrain of the sympathetic type, and OG2 consisting of 9 athletes, who were noted into overstrain of parasympathetic type. The comparison group (CG) consisted of totally 202 highly skilled athletes.

With the help of CMM, the results of performing three simple motor tests (Crollen et al., 2017; Pankova, 2003) performed by the right and left hands determined 25 digital motion parameters. In this study we will looked the change of the parameter of the switching of central settings (SCS, sec.), which reveals the activity of the prefrontal cerebral cortex and, given the asymmetry, can be informative about of the course energy processes in the body of athletes (Romanchuk, 2007). In Figure 2 shown principle of measured this parameter.

This test consists in performing repeated turns of the lever in the horizontal plane left and right in the range indicated by light markers. The task is determined by the instruction: "Will necessary turning the lever as fast as possible from the one light marker to another. You will need to change the direction of movement exactly on the light marker." This instruction defines the main feature of the motor task – the conflict between the requirements of accuracy and speed. Accordingly, with the help of this test, an individual balance is determined for each subject between the maximum possible speed and accuracy of movement, which is achieved during the implementation of the task.

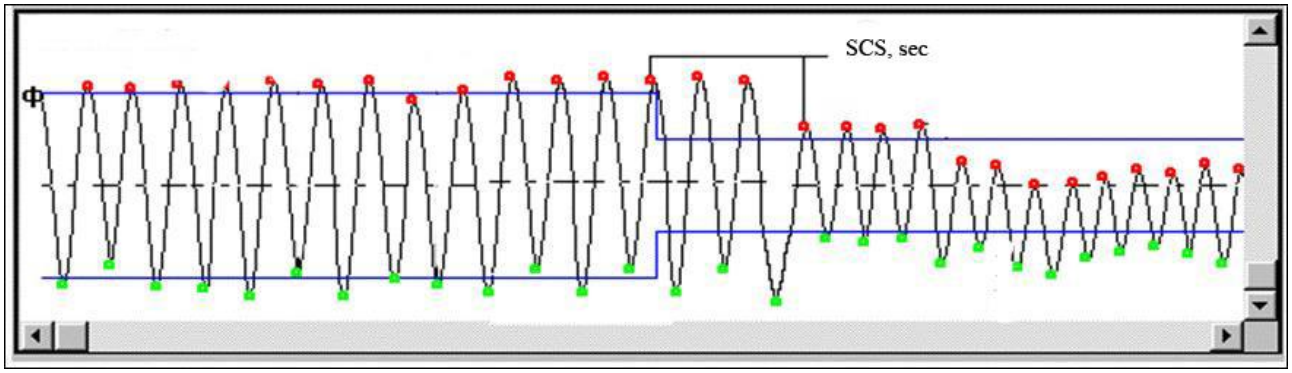

Figure 2. The principle of determining the SCS (sec) in a motion test with use the device "CMM".

SCS is measured as follows. After making turns of the lever with a stable amplitude for 10–15 sec (the period of "working on" into a certain moving mode), one of the LEDs is suddenly turned off for the subject and another pair of markers is turned on. The distance between them and the position on the perimeter differ from those for the previous pair. In accordance with the changed position of the signals defining the range of lever turns, the subject must urgently change the mode of movement – its amplitude and spatial orientation. In the test program, the movement mode changes twice for each hand.

Non-parametric methods of analysis using Wilcoxon and Mann-Whitney criteria were used to identify differences between groups and indicators in the dynamics of observation.

Results

In Table 1 presents the characteristic differences of routine indicators of body structure and cardiovascular activity in the groups being analyzed. The differences from the CG in OG_2, which relate to: significantly smaller values of body mass (BM) ($p<0.05$), body mass index (BMI) ($p<0.05$), chest circumferences (CC) ($p<0.05$), contours abdomen ($p<0.05$), contours hips ($p<0.05$), significantly greater values of thorax mobility ($p<0.05$), force index (FI) ($p<0.05$). Significant were the differences in systolic blood pressure (ATS) ($p<0.05$), vegetative index ($p<0.05$), Robinson index ($p<0.05$), Baevsky AP ($p<0.05$), which are significantly smaller and indicate a better functional state of the body and a pronounced predominance of parasympathetic effects. This fact is confirmed by significantly higher values of the physical state level (PSL) according to Pirogova ($p<0.05$).

At the same time in OG_1 compared with CG differences show significantly greater values of body mass, ($p<0.05$), body area, ($p<0.05$), chest excursions, ($p<0.05$), hips ($p<0.05$), abdomen ($p<0.05$) and fat content ($p<0.05$). There are lower SBP values ($p<0.05$) against higher DBP values ($p<0.05$). However, all other routine indicators and indices of the cardiovascular system from the CG are not significantly different.

Table 1. Morphofunctional differences athletes at baseline at overstrain by sympathetic (OG_1) and parasympathetic (OG_2) in comparison with comparison group (CG).

Parameter	CG n=202	OG_1 n=10	OG_2 n=9
BM, kg	72.0 (62.0; 82.0)	80.0 (61.0; 94.0)^{a}	66.5 (61.0; 81.0)^{b}
Length, cm	179.0 (170.0; 185.0)	181.5 (170.0; 189.0)	179.0 (175.0; 185.0)
BMI, kg/m^2	22.5 (20.9; 25.2)	23.6 (21.4; 27.3)	20.5 (19.9; 24.2)^{ab}
Body area, m^2	1.92 (1.74; 2.04)	2.02 (1.70; 2.18)^{a}	1.85 (1.74; 2.03)^{b}
Chest circumferences, cm	96.0 (91.0; 101.0)	98.5 (89.0; 113.0)	91.0 (90.0; 96.0)^{ab}
Thorax mobility , cm	7.0 (5.0; 8.0)	8.5 (7.0; 10.0)^{aa}	8.0 (7.5; 9.0)^{a}
Contours abdomen, cm	78.0 (74.0; 86.5)	82.5 (74.0; 92.0)	75.0 (73.0; 82.0)^{ab}
Contours hip, cm	52.0 (48.0; 56.5)	56.0 (50.0; 60.0)^{a}	48.0 (45.0; 57.0)^{ab}
FI, %	64.4 (59.5; 68.9)	64.5 (51.1; 77.3)	66.3 (55.6; 68.9)^{a}
VLC, ml	4800 (4400; 5600)	4850 (4400; 6600)	4850 (4500; 4900)
VI, ml/kg	67.9 (61.9; 73.1)	65.2 (62.9; 70.2)	69.3 (59.3; 73.8)
BFP, %	11.8 (8.7; 18.1)	18.4 (8.1; 19.0)^{a}	13.3 (6.5; 20.3)
SBP, mmHg	120 (110; 130)	115 (110; 120)^{a}	115 (100; 120)^{a}
DBP, mmHg	70 (64; 80)	80 (70; 80)^{a}	70 (70; 80)
Vegetative index	-0.19 (-0.35; -0.05)	-0.27 (-0.59; -0.05)	-0.34 (-0.45; -0.28)^{ab}
Robinson's index	71.8 (64.6; 81.8)	73.6 (65.1; 75.7)	60.3 (51.7; 75.8)^{ab}
Baevsky's AP	2.02 (1.87; 2.25)	1.98 (1.84; 2.12)	1.79 (1.52; 1.99)^{abb}
Pirogova's LPS	0.746 (0.672; 0.822)	0.736 (0.692; 0.762)	0.823 (0.753; 0.901)^{ab}

Note. ^{a} – $p<0.05$, ^{aa} – $p<0.01$, between OG_1 and OG_2 in comparison with CG; ^{b} – $p<0.05$, ^{bb} – $p<0.01$, between OG_2 and OG_1.

Table 2 presents the absolute values of the measurement of SCS when performing the test with the right and left hands at all stages of observation of athletes. The most significant acceleration in the initial state (S_1) of the SCS when performing the test with the left (SCSl) and right (SCSr) hands was in OG_1 compared with CG and OG_2 (P-value<0.05). At the same time, when performing the test with the right hand in the initial state in OG_2, the greatest slowdown of SCSl (P-value<0.05) was observed among the studied groups. That is, a reduction in the time of SCSl and SCSr prior to exercise may predict an excessively sympathetic response to the cardiovascular system.

Table 2. Differences in switching rates of switching of central settings in highly skilled athletes under the influence of intense training load and in the period of early recovery thereafter.

Parameter	Control point	CG n=202	OG_1 n=10	OG_2 n=9
SCS l	S_1	1.62 (1.15; 2.42)	1.26 (0.96; 1.38)^{a}	1.90 (1.49; 2.20)^{b}
	S_2	1.49 (1.07; 2.29)	0.96 (0.91; 1.82)^{ac}	2.20 (1.38; 3.22) ^{bca}
	S_3	1.67 (1.24; 2.35)	1.65 (1.24; 2.09)^{cd}	2.45 (1.68; 3.11) ^{abc}
SCS r	S_1	1.62 (1.07; 3.08)	1.15 (0.85; 1.51)^{a}	1.82 (1.71; 2.12) ^{abb}
	S_2	1.57 (1.13; 3.36)	1.51 (1.24; 1.65)^{c}	1.38 (1.26; 1.46) ^{abcc}
	S_3	2.04 (1.21; 3.77)^{dc}	1.95 (1.13; 2.28)^{cd}	1.73 (1.13; 1.76) ^{abcd}

Note. ^{a} – p<0.05, between OG_1 and OG_2 in comparison with CG; ^{b} – p<0.05, ^{bb} – p<0.01, between OG_1 and OG_2; ^{c} – p<0.05, ^{cc} – p<0.01, between S_2 and S_3 in comparison with S_1; ^{d} – p<0.05, between S_2 and S_3.

At S_2, sufficiently characteristic changes are observed, which indicate the absence of changes in the SCSl and SCSr indicators in CG, a significant acceleration of SCSl (P-value<0.05) and a significant slowdown of SCSr (P-value<0.05) in OG_1, as well as a significant slowdown of SCSl (P-value<0.05) and a significant acceleration of SCSr (P-value<0.01) in OG_2. That is, after physical load a significant acceleration of the accelerated SCSl in the initial state, which is accompanied by a significant slowing of the accelerated SCSr in the initial state, can predict an excessively sympathetic response of the cardiovascular system. On the other hand, significant slowdown (within the regulatory limits) of the SCSl against the background of significant acceleration (within the regulatory limits) of the SCSr can predict excessive parasympathetic response of the cardiovascular system.

At S_2, changes in SCS indices in CG indicate a significant slowdown of SCSr (P-value<0.05) compared to S_1 and S_2 with the invariance of SCSl; in OG_1, SCSl and SCSr indicators indicate a significant increase compared to S_1 and S_2 (P-value<0.05); in OG_2, SCSl is significantly different from S_1 (P-value<0.05) but not S_2, and SCSr is significantly less than S_1 (P-value <0.05) and significantly greater than S_2 (P-value<0.05). That is, characteristic of OG_1 the next morning after training is the slowdown of the central level of regulation of sensorimotor function in comparison with the baseline level when performing tests with the right and left hands. The OG_2 is characterized by a slowdown of the central level of regulation of the sensorimotor function compared to the baseline level when performing the test with the left hand and speeding up when performing the test with the right hand.

In the development of overstrain of cardiovascular system at a sympathetic type, the slowdown of the SCS with both the right and left hand is noted, as compared to the initial state and the state after physical activity. In this case, the SCS values do not differ in the OG. At the same time, at overstrain by parasympathetic type, the slowdown is observed when performing the test with the left hand, in comparison with the initial state, and it does not differ from the state after exercises and is significantly slower than in the OG (P-value<0.05) and at sympathetic overstrain (P-value<0.05). On the other hand, when performing the test with the right hand, the SCSr has intermediate values between S_1 and S_2, which indicates the reverse tendency of the central processes of sensorimotor regulation the next morning after training, which, at the same time, are significantly faster than in the OG (P-value<0.05) and at sympathetic overstrain (P-value<0.05).

That is, characteristic asymmetric changes at the central level of regulation of sensorimotor function are noted at sympathetic and parasympathetic overstrains of the cardiovascular system of athletes.

Discussion

According to the results of the analysis of the data in the initial state, before physical activity, rather informative differences between the studied groups were revealed, which indicated a greater speed of the processes of switching movements in the cortical motor areas of both hemispheres in individuals who subsequently formed an overreaction of the sympathetic division of the ANS, which led to overstrain of the cardiovascular system.

An asymmetric functional response to intense physical activity, characterized by significant acceleration of central processes in the right hemisphere and significant slowdown in the left, is different for sympathetic overstrain. This information complements the data obtained by Fokin et al. (2009) in the study of the level of constant potential of the brain, which indicate the greater importance of the right hemisphere in determining the effects of stress. It should also be mentioned that, according to many scientists (Berdychevskaia et al., 2009; Noskin et al, 2005), the change of the dominant hemisphere occurs when the athlete's performance is reduced. However, in this case it is not possible to talk about it.

Importantly, the asymmetric functional response to physical activity, but of the opposite orientation, is also characteristic of parasympathetic overstraining. It is characterized by slowing of the central processes in the premotor zone of the right hemisphere and acceleration in the left hemisphere. That is, given the data obtained by Pestryayev and Safina (2014), who showed that in most cases the left hemisphere has closer functional connections with trophotropic systems of regulation and the right one with ergotropic systems, it can be stated that the results obtained by the study of the sensorimotor function fully reflect the processes occurring in the autonomous regulation of the cardiovascular system. In this case, such changes in the central mechanisms of regulation precede the development of overstrain of the ANS in the regulation of the heart (Moskvyn & Moskvyna, 2015; Romanchuk, 2007).

Characteristic of all athletes during the recovery period is a certain slowdown of the central processes of the left hemisphere, although the processes in the right hemisphere remain unchanged compared to the original state and the state after physical activity.

Changes in the central mechanisms in athletes with the formation of cardiac-vascular system overstrain in the sympathetic type, in which the excitation processes were significantly slowed down in the right and left hemispheres of the brain, both in comparison with the initial state and with the state after loading, were informative. In this case, the functional asymmetry that arose after intense physical activity disappeared. This variant of changes testifies to the deterioration of both energy and plastic processes in the body of athletes.

Athletes with the formation of parasympathetic overstrain during the recovery period show the most pronounced slowing of the central processes in the right hemisphere, which, given the previously mentioned data, can indicate significant energy savings. At the same time, significant activation of the left hemisphere after intense physical activity remains sufficiently active the following morning after intensive training in comparison with the initial state, which can testify to the intensive course of trophotrophic processes in the body of athletes (Chermit, Shakhanova, & Zabolotniy, 2014; Romanchuk, 2003).

Conclusions

In the case of sympathetic and parasympathetic overstrains of the cardiovascular system of athletes under the influence of intense physical activity and in the period of recovery, characteristic asymmetric changes at the central level of regulation of sensorimotor function are noted which can attest to the predominant course of ergotropic and trophotrophic processes in organism of athletes. The studies have underlined the importance of testing the sensorimotor function in the training.

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Ethical approval

Permission for this study was obtained from the ethics committee of both institutions and informed consent was obtained from athletes.

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LETTER TO THE EDITOR

Therapeutic Competencies in Reducing Emotional and Social Distress after Cognitive Behavior Therapy Training Program

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Dear Editor!

Psychotherapeutic competence is conceptualized as a therapist's general and treatment-specific knowledge level, skill level, and values or attitudes while implementing therapeutic interventions (Kühne, Meister, Maaß, Paunov, & Weck, 2019). Assessment of psychotherapeutic competences are essential to training, supervision, clients care, quality control, and life-long practice (Kühne, Lacki, Muse, & Weck, 2019). Assessment of therapeutic competence may provide therapists with formative and summative feedback and may guide self-reflection (Muse & McManus, 2013).

This study is interested in investigating how cognitive therapy training could help school psychologists to offer better help for students known with emotional and social problems. School psychologists are capable to help students with their psychological problems, as they spend relatively long time with them and know about their strengths and weaknesses as well. Adjustment in school environment is very important and has a great impact on student's overall adjustment and psychological health. Cognitive behavior therapy is known as an effective treatment for many of the psychological problems (Beck, 1993; Beck, 1997; Beck, 2005; Beck, Baruch, Balter, Steer, & Warman, 2005). but results depend on the therapists' skill and competences (Kazantzis et al., 2018). Training could enhance cognitive behavior therapy skills and enable those psychologists to help students to cope with their emotional and interpersonal problems. Supervision is essential in learning cognitive behavior therapy. Despite the divergence in systems of psychotherapy, their goals and varied training practices, supervision remains the one component considered essential to all (O'Donovan, Halford, & Walters, 2011).

This paper addresses the question: is a brief cognitive behavior therapy (CBT) training program enhances psychologist's skills as reflected in scores on Cognitive Therapy Skills scale and in helping students with emotional and social problems.

35 school psychologists (20 Female and 15 male) have received intensive CBT training for 6 days during two weeks followed by one to one supervision in school sittings for three months. Participants completed cognitive behavior therapy scale (CBTS) before and after training. Individual and group counseling sessions delivered to male and female (age mean=13.7 years) students known of emotional and social problems during the current school year. Supervisors wrote a report in the end of three months' practice, students and parent's feedback collected.

Results show that differences between pre and post scores on CBTS scale are statistically significant (t=4.92), supervisors reports and students' feedback indicate improving therapeutic skills by the end of three months' practice.

CBT training program has positive influence in enhancing CBT skills in school psychologists that reflected in providing effective counseling for students with emotional and social problems. Supervision helped in optimizing the therapeutic outcome in both individual and group therapy sessions.

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Ethical Approval

The study protocol was consistent with the ethical guidelines of the 1975 Declaration of Helsinki as reflected in a prior approval by the Institution's Human Research Committee.

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LETTER TO THE EDITOR

Present Day Deviations of Thinking of the Internship Doctors

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Dear Editor!

Within recent years, we have conducted a series of investigations on the diagnostics of mosaic thinking since presently, the process of substitution of the fragmented (mosaic) thinking for the medical judgment is progressively going on among the individuals getting the postgraduate medical education (Yekhalov, Yehorov, Pavlysh, & Barannik, 2020). For the purpose of verbal estimate of the quality of thinking of the internship doctors, we have used a modified test of thinking and creativity, which was created by Bruner, an American psychologist. Over three years, an anonymous testing has been held in four peer groups of the 1st year internship doctors majoring in Anesthesiology, Stomatology and Neurology (exactly 100 respondents in each group). The test questionnaire was focused on the preference of the textual or pictorial information; on the character of the representation of information (i.e., as a text, as a visual imagery, or both these characters equally); on the using of the symbolic information coding; on the selection of a solution as for the representation of pictorial information; on the interrelation between the actions themselves and the discussing of such actions; on the extent and rate of the information handling; on the way-finding in a non-homogenous informational space; on the fatigue level, and so on.

The quantity of the internship doctors with a high level of the theoretical (elastic) thinking has equally ranged in the aforesaid study groups (that is, 25%, 24% and 26% respectively); thereat, among the internship doctors majoring in Stomatology, the rate of these doctors with a medium level of the elastic thinking was by 11% lower than such rate among the internship doctors majoring in Anesthesiology and Neurology; and the rate of the internship doctors with a low level of the theoretical thinking among the doctors majoring in Stomatology, was higher by 8% and 9% respectively than such rates among the doctors within two other aforesaid study groups. Whilst, the a-priori knowledge enables to apperceive the factual information, to tease out the certain facts from the general observations, to provide general insight into the certain phenomena (i.e., to reveal the essence of such phenomena), to answer the questions in relation thereto how and why these or those processes occur in the human body. First of all, the true professionalism of a doctor is aligned with the theoretical (reflective) mode of thinking. And exactly such mode of thinking (but not an algorithm) provides tremendous advantages to a doctor when solving the job tasks related to the diagnosis, medical treatment and prevention.

A high level of the imaginative (creative) thinking of the internship doctors majoring in Anesthesiology and Neurology, was identical to the level of their theoretical thinking; while the same level among the doctors majoring in Stomatology, was by 5% lower. A medium level of the creative thinking prevailed, and it amounted almost to 50% in all the groups of respondents; and a low level of the creative thinking was observed as for 25% of all the respondents.

The creativity characterizes the creative abilities of an individual, his/her readiness to the creation of the fundamentally-novel ideas which diverge from the

conventional or currently-accepted schemes of thinking; as well as it characterizes the problem-solving ability as to the problems arising within the static systems. The present-day researchers have proven that the internship doctors with a high level of the creative thinking manage the solving of the clinical case problems twice as fast, and what is more, they advance and convey more various ideas under certain specific conditions, and offer the various types of the health care services (Melnyk, Yekhalov, & Sedinkin, 2020).

As compared to our investigations conducted three years ago (under the test technique created by Litvinova), we have experienced a 20-27% growth in the number of the persons with the fragmented thinking among the internship doctors. Thereat, a high level of the mosaic thinking was observed among the internship doctors majoring in Stomatology twice as often as among such doctors majoring in Anesthesiology and Neurology. A medium level of the fragmented thinking was registered almost for one half of all the respondents; and such level prevailed among the internship doctors majoring in Stomatology, being observed among them by 11% more often. Meanwhile, to the contrary, the quantity of the persons with a low level of this type of thinking has ranged in favor of the internship doctors majoring in Anesthesiology and Neurology. An internship doctor with mosaic thinking faces the difficulties in comprehension of the gross appearance, and consequently, he/she perceives only the fragmentary pieces of data, and is not capable to correlate them to other ones. At the mosaic thinking, the uptake of information proceeds by way of the increase in quantity due to the depreciation of quality. It has been proven scientifically that only 2% of the human subjects are capable to make use of the multitasking efficiently and in a maximally-qualitative manner. Thus, not the practicable medical conceptions are formed by such future doctors, but only the imageries of separate pathologic features, what results in the diagnostic reasoning based on the formal comparison operations (that is, the reasoning on the basis of analogy). As a rule, a present-day secondary school leaver is ill-trained for the solving of the tasks related to the handling of the written information, and therefore, such a leaver does not have either the skills of the reading of the texts in a qualitative manner and of the interpretation of such texts, or the skills of the oral and written representation of the reads. Consequently, the training methods created for the persons with the conceptual thinking, are senseless for the persons with the mosaic thinking.

The healthcare system needs the creative professionals no less than other fields of the social and economic sectors. This translates to the transition to the new educational standards in the system of medical education, which are focused on the competency-based approach and assume the development of the reflective and creative learning technologies. Within the framework of the pre- and postgraduate education, there is observed a conflict between the cognitive style of the information uptake and the conventional, conceptual presentation of the information. Therefore, an up-to-date valid adaptation to the deviations of thinking of the persons receiving training, is needed. Thereupon, the hands-on trainings and workshops, the drawing of the mental maps, the gamification, and the maximum use of the visual content formats are of considerable importance (Tsarevskaya & Iudalevich, 2020). The logic of content of the education programs in the medical fields of study must correspond to the logic of the data source relations in terms of the genesis and development of a pathogenic process. Such architecture of content of a student course will be aligned with the principle of transition from the abstract to the concrete (that is, from the moment of interaction of the pathological factors with the certain systems of the human body to a specific nosological entity). When focusing on the logo in the process of training, there appears an opportunity for the solving of the entire class of the job tasks covered by a certain medical field. Such method of determination of the content and techniques of the professional training of a doctor will enable to develop the doctor's theoretical thinking, and thus, to develop the doctor's abilities not only to solve the routine tasks concerning the diagnosis, medical treatment and prevention, but also to solve the non-routine tasks concerning the same problems.

Conclusions:

1. The level of the fragmented thinking among the internship doctors majoring in various special fields, is presently almost the same as the level of their theoretical and creative thinking, what is more than by one fourth higher as compared to the findings of our investigation conducted three years ago.
2. The architecture of an up-to-date training process in correspondence with the requirements of the relevant education program must pay due consideration to the educational tasks against the background of the progressive changes in terms of the shift in mindset within the society.
3. Under present-day conditions of a total deviation of the individuals' thinking, there is needed an up-to-date valid adaptation of the logic and content of the education programs within the framework of the pre- and postgraduate medical education.

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