



# **SCIENTIFIC RESEARCH OF THE SCO COUNTRIES: SYNERGY AND INTEGRATION**

**上合组织国家的科学研究：协同和一体化**

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这些会议文结合了会议的材料 – 研究论文和科学工作者的论文报告。它考察了职业化人格的技术和社会学问题。一些文章涉及人格职业化研究问题的理论和方法论方法和原则。

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# CONTENTS

## ECONOMICS

企业家领导作为现代企业活动中的指挥层现象

Entrepreneurial leadership as a command level phenomenon in the activities of modern

*Bulatetskaya Alena Yuryevna*.....8

乌克兰事件背景下金砖国家在构建世界新秩序过程中的转型

Transformation of BRICS in the process of forming a new world order in the light of Ukrainian events

*Kharlanov Alexey Sergeevitch, Sherysheva Elena Ivanovna*.....18

现代信息技术在大学远程学习中的可能性

The possibilities of modern information technologies in distance learning at the university

*Banko Natalya Anatolyevna*.....23

## PEDAGOGICAL SCIENCES

生物系在远程和全日制教育条件下使用交互式视频工作室“Jalinga”和职业指导进行教育过程数字化的经验

The experience of the department of biology in digitalization of the educational process using the interactive video studio "Jalinga" and career guidance in the conditions of distance and full-time education

*Larina Natalia Petrovna, Solovieva Yulia Germanovna, Chistyakova Natalia Sergeevna*.....31

## PHILOLOGICAL SCIENCES

社会康复中心未成年人的社会适应

Social adaptation of minors in a social rehabilitation center

*Taranova Olga Vladimirovna, Lebedeva Anna Sergeevna*.....36

## POLITICAL SCIENCE

俄罗斯在乌克兰的 SMO 对欧洲美国化的影响以及俄罗斯在构建多中心世界中的作用

Influence of Russia's SMO in Ukraine on the Americanization of Europe and the role of Russia in building a polycentric world

*Kharlanov Alexey Sergeevitch, Likhonosov Alexander Gerontievich, Boboshko Andrey Alexandrovich, Evans Julia Nailiyevna*.....43

全球化和区域化趋势：对现代国家联邦结构的科学理论和实践的影响（政治和法律研究）

Trends towards globalization and regionalization: influences on the scientific theory and practice of the federal structure of the modern state (political and legal research)

*Ovsepyan Zhanna Iosifovna*.....50

表现出作为俄罗斯联邦公民主要价值观之一的心态特征

Manifestation of mentality features as one of the main values of the Russian Federation citizens

*Afonin Andrey Alexandrovich*.....59

## MEDICAL SCIENCES

学龄前儿童严重合并颅脑损伤的平均动脉压昼夜节律

Circadian rhythm of mean arterial pressure in severe concomitant traumatic brain injury in preschool children

*Muhitdinova Hura Nuritdinovna, Abdusalieva Tursunoy Mutanovna*.....66

在占主导地位的院士A. A. 乌赫托姆斯基的影响下，经受过COVID-19，患有冠心病的成年第二期妇女的肺部生命力的时间生物学指标。

Chronobiological indicators of the vital capacity of the lungs of women of the second period of adulthood who have endured COVID-19, suffering from coronary heart disease, under the influence of the dominant academician A.A. Ukhtomsky

*Boyarshkaya Larisa Alexandrovna, Prokopiev Nikolai Yakovlevich, Ananiev Vladimir Nikolaevich*.....74

冠状病毒大流行背景下人群自我隔离态度的情绪特征

Emotional features of the attitude of the population to self-isolation in the context of the coronavirus pandemic

*Kitova Dzhusetta Albertovna, Aprelikova Natalia Ruslanovna*.....84

严重合并颅脑损伤对学龄前心脏每搏量的影响

Influence of severe concomitant traumatic brain injury on heart stroke volume in preschool age

*Muhitdinova Hura Nuritdinovna, Hamrayeva Gulchehra Shahobovna, Vasilchenko Venera Zagirovna*.....92

孕妇急性肾盂肾炎的现代治疗方法

Modern approach to the treatment of pregnant women with acute pyelonephritis

*Khvorostukhina Natalia Fedorovna, Plekhanov Alexander Alexandrovich, Novichkov Denis Anatolyevich*.....99

3. 1-7岁儿童严重合并颅脑外伤急性期每分钟血液循环量的昼夜节律。

Circadian rhythm of minute volume of blood circulation in the acute period of severe concomitant traumatic brain injury in children of 3.1-7 years of age.

*Muhitdinova Hura Nuritdinovna, Hamraeva Gulchehra Shahobovna, Shomurodov Akmal Yangibayevich*.....106

## PHARMACEUTICAL SCIENCES

酞菁锌和基于它的抗癌药

The Zinc Phtalocyanine and an anti-cancer drug on the basis it

*Khromov Arkadiy Valentinovich* .....114

## EARTH SCIENCES

提高农业用地生态和经济效益的概念性规定

Conceptual provisions for improving the ecological and economic efficiency of agricultural land use

*Tsyppkin Yuri Anatolyevich, Bliznyukova Tatiana Viktorovna,*

*Fomina Anastasia Vladimirovna, Ilya Vitalievich Chuksin*.....122

## TECHNICAL SCIENCES

蔬菜作物滴灌垂直栽培营养液投配技术及系统

Technology and system of feeding and distribution of nutrient solutions for vertical cultivation of vegetable crops on drip irrigation

*Zhuravleva Larisa Anatolyevna, Aldiab Anas*.....130

带“智能模块”的大范围洒水机

Wide-reach sprinkler Machine with "Intelligent Module"

*Zhuravleva Larisa Anatolyevna, Heirbeek Bassel*.....135

系统分析方法在解决现代凝汽式火电厂环境问题中的应用

Application of system analysis methods to solving the environmental problems of modern condensing thermal power plants

*Fedorova Natalia Vasilyevna, Veselovskaya Elena Vadimovna*.....140

水溶液的机械和电磁活化

Mechanical and electromagnetic activation of aqueous solutions

*Rudnev Sergey Dmitrievich, Krikun Alexandra Igorevna,*

*Feoktistova Veronika Vyacheslavovna, Ivanov Viktor Vladimirovich,*

*Sumenkov Maxim Viktorovich*.....150

使用无人机监测工程结构变形的经验

Experience in the use of unmanned aerial vehicles in monitoring the deformation of engineering structures

*Akhmedov Bakhtiyor Nazrulloevich, Zaydullov Usmonjon Zavaralievich,*

*Akhmedova Gulnoza Zafarovna*.....157

基于海藻酸盐凝胶的植物提取物在冷熏红鲑生产技术中的应用论证

Justification of the use of plant extracts based on alginate-containing gel in the production technology of cold-smoked sockeye salmon

*Saltanova Natalia Sergeevna*.....165

使用语义组进行情感分析

The use of semantic groups for sentiment analysis

*Suldin Roman Yurievich*.....174

企业家领导力作为现代公司活动中的一种指挥层现象

## ENTREPRENEURIAL LEADERSHIP AS A COMMAND LEVEL PHENOMENON IN THE ACTIVITIES OF MODERN COMPANIES

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抽象的。本文分析了企业家领导概念的理论基础。已经确定了定义企业家领导力的关键方法,这使得追踪概念发展的演变成为可能。企业家领导力概念的起源是确定的,它位于领导力和企业家精神的理论基础的交汇处。给出了创业型领导的特点和主要作用。指出了创业领导力研究的方向和参数,包括创业领导力的形成因素、组成和联系以及团队活动的结果。

关键词: 领导, 管理, 领导风格, 创业型领导, 创业型领导的构建和作用。

**Abstract.** *The article presents an analysis of the theoretical foundations of the concept of entrepreneurial leadership. The key approaches to the definition of entrepreneurial leadership have been identified, which make it possible to trace the evolution of the development of the concept. The origins of the concept of entrepreneurial leadership, which lie at the intersection of the theoretical foundations of leadership and entrepreneurship, are determined. The characteristics and main roles of entrepreneurial leadership are given. The directions and parameters of entrepreneurial leadership research are indicated, including the factors of formation, components and connections of entrepreneurial leadership and the results of the team's activities.*

**Keywords:** *leadership, management, leadership styles, entrepreneurial leadership, construction and roles of entrepreneurial leadership.*

The modern business world is undergoing drastic changes, which to a large extent affect the managerial sphere of activity. The crisis of the established management paradigm leads to a serious transformation of the business and many (if not almost all) key components of the management system [1]. The changes concern both the company itself, its purpose and goals, and many internal organizational processes. For decades, the business world has focused on building successful, high-performing corporations that want to outperform their rivals and win the

competitive race. The measure of success in the market space was the achievement of maximum quantitative indicators, primarily profitability indicators. Nowadays, in an increasingly unpredictable and competitive modern dynamic economy and a rapidly changing business environment, companies need a new type of manager - an enterprising leader who differs in behavioral norms from the classic business leader.

Entrepreneurial leadership is based on the fact that the leader sees himself as an entrepreneur running his own business.

Leaders of this type:

- take the initiative and energize people, act as if they play a critical, and not just important, role in the company;
- demonstrate entrepreneurial creativity, constantly look for new opportunities and use them;
- take risks, dare to start new risky business projects, set strategic direction and inspire their people;
- take responsibility for their team's failures, learn from those failures and use them as a stepping stone to success and strategic achievement.

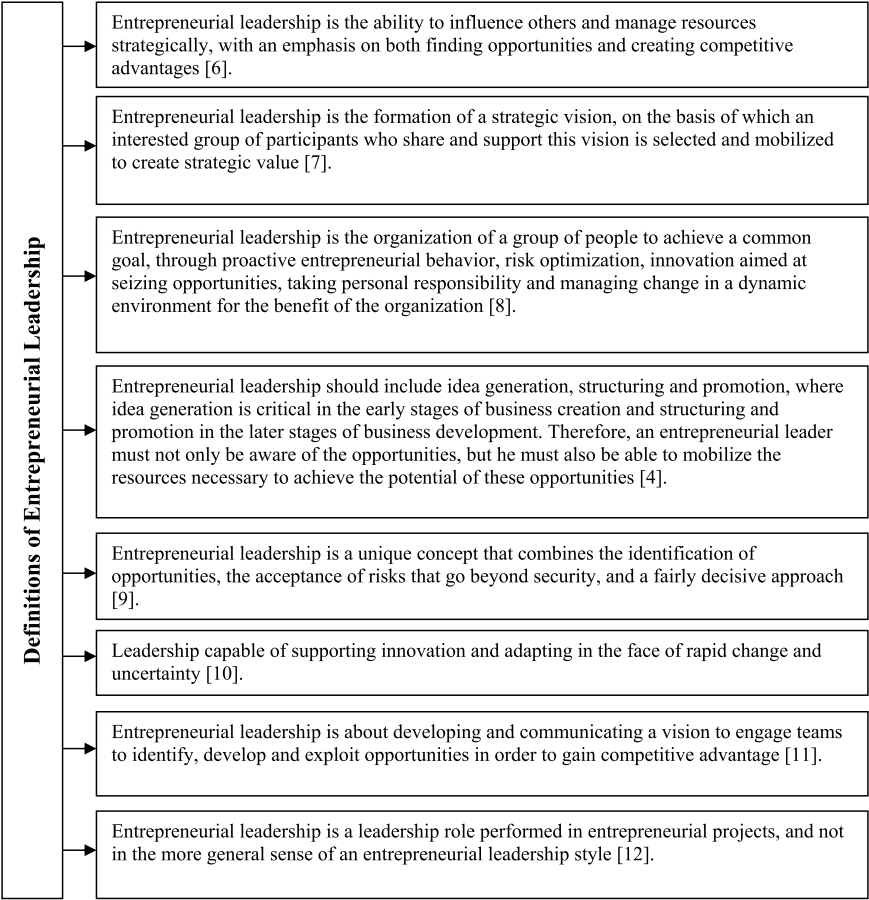
Entrepreneurial leadership requires great self-confidence in order to think, behave and act like an entrepreneur in the interests of realizing the company's vision for the benefit of all its players.

In the generally accepted context, a leader (from the Engl. leader - leader, leader) is a person who is recognized by a certain community as having the right to make responsible decisions that are most significant from the point of view of group interest [2], and leadership (from the English leadership) - is a process social influence, in which the leader receives the support of other members of the community to achieve the goal. Leader and leadership are words of English origin, formed from the Anglo-Saxon root lead ("road, way") and the verb leaden ("to travel, go") [3].

Entrepreneurial leadership (EL) as a new research concept is gaining more and more popularity among foreign and domestic scientists and practitioners, both in the field of entrepreneurship and in the field of leadership. Most of the research today is focused on the study of the "leadership" qualities of entrepreneurs, as well as the "entrepreneurial" qualities of leaders, based on the common characteristics and connections of two scientific fields: entrepreneurship and leadership [4, 5].

Fig. 1 presents a number of definitions of entrepreneurial leadership, which can trace the development of the concept of EL. As can be seen, there are different approaches to the definition of the term, which is often an obstacle to the further development of the concept and its use for empirical research. At the same time, at the present time, one cannot fail to note some progress in empirical research on entrepreneurial leadership.

From the literature review, it follows that the development of entrepreneurial leadership has led to the emergence of two approaches to its definition: 1) entrepreneurial leadership as a special type (style) of leadership and 2) a special role of the manager (leader) in entrepreneurship.



*Figure 1. Definitions of Entrepreneurial Leadership (Author's Work)*

The focus on the study of entrepreneurial leadership has traditionally been twofold, depending on whether the starting point is entrepreneurial theory or leadership theory. For some writers, entrepreneurial leadership is simply a type of leadership that comes into play under certain conditions, such as starting a new business or running a small, fast-growing company. According to this view, vari-

ous problems in entrepreneurial leadership can be understood and studied with the help of easily accessible theory in the field of leadership and interpersonal influence. Such a perspective, admittedly, implies a unidirectional transfer of concepts from the field of leadership to entrepreneurship [13].

For other scholars [14, 9], the world is at the center of an “entrepreneurial revolution”, and entrepreneurship itself is “an integrated concept that permeates our society and individuals in an innovative way”. Entrepreneurship becomes the essence of leadership. A leader in terms of entrepreneurship is a manager (entrepreneur) who is able to recognize opportunities, create a vision and mobilize key resource holders to realize their vision and create value [6, 7]. This new generation of entrepreneurs is innovative, they understand how to deal with risk and uncertainty.

The dominant theoretical framework for entrepreneurial leadership is the typology proposed by Gupta et al. [7], which focuses on five roles of entrepreneurial leadership. Characteristics and descriptions of the five roles are given in tab. 1 [15, p. 107].

**Table 1**  
*The Five Roles of Entrepreneurial Leadership*

Role	Role description	Description
Framing the challenge	Result orientation	Sets high standards of work
	Ambitiousness	Works hard and sets high goals
	Awareness	Knowledge of the situation
	Intuition	Insight
Absorbing uncertainty	Has a forecast	Anticipates possible future events
	Inspires confidence	Instills confidence in others by showing confidence in them
Underwriting	Diplomatic approach	Experienced in interpersonal relationships
	Negotiator	Collaborates with others on favorable terms
	Persuasiveness	Able to convince others to accept his or her point of view
	Reliability	Calms and gives hope to others
Building commitment	Motivated (diligent)	Demonstrates positive emotions and motivates for work
	Inspirational	Motivates others through emotions, beliefs, values, and behaviors to work hard
	Team founder	Encourages team members to work together
	Focused on improvements	Strives to continuously improve performance

Defining gravity	Integrator	Brings people together into a cohesive team
	Optimistic	Usually shows optimism and confidence when faced with difficulties
	Intellectually stimulating crucial	Motivates its followers to think and act more innovatively
	Decisive	Makes decisions firmly and quickly

The first three roles of entrepreneurial leadership, namely willingness and ability to solve complex problems, absorption (mitigation) of uncertainty, and support, require the leader to have the entrepreneurial ability to identify opportunities for the development of sustainable competitive advantages [8]. The next two roles of entrepreneurial leadership, namely, the formation of commitment and significance, require the leader to be able to motivate his team and mobilize resources to realize opportunities [16]. Effective entrepreneurial leadership means demonstrating the abilities of both entrepreneurs and successful leaders and, judging by the results of some studies, is important for the survival and development of new enterprises [17]. However, the mechanism for increasing the effectiveness of entrepreneurial leadership as a new type of leadership in new enterprises remains unclear [18].

Thus, the most common definition of EL to date [7], emphasizes the task of the “entrepreneurial leader” to create a vision, mobilize resources and find an interested team that can accept his vision and is necessary to create strategic values. The two problems of creating a vision and building a team of competent and dedicated supporters are interdependent, as the former is useless without the latter. Thus, entrepreneurial leaders define and carry out a set of active actions to transform the company, leading to its growth and development [7, 19, 20].

Three areas of research are devoted to the problem of entrepreneurial leadership, including: 1) factors in the formation of entrepreneurial leadership; 2) components of entrepreneurial leadership; 3) links between entrepreneurial leadership and the performance of a firm or team (tab. 2). [21, p. 244].

**Table 2.**  
*Areas of research in entrepreneurial leadership*

Direction	Parameters
Factors in the formation of entrepreneurial leadership	<ul style="list-style-type: none"> <li>- Institutional environment</li> <li>- Human and social capital</li> <li>- Ethics of conduct</li> <li>- Hopes and expectations of the leader</li> <li>- Entrepreneurial vision and type of organization</li> <li>- Maturity of a firm or a team</li> </ul>



Components of entrepreneurial leadership	<ul style="list-style-type: none"> <li>- Personality traits: character traits, behavioral characteristics, roles performed, approaches to doing business</li> <li>- Competencies</li> <li>- Features of female entrepreneurial leadership</li> <li>- Elements of command-level entrepreneurial leadership</li> </ul>
The relationship between entrepreneurial leadership and the performance of a firm or a team	<ul style="list-style-type: none"> <li>- Innovative behavior of employees: direct impact; influence through psychological empowerment</li> <li>- The ability of workers to identify opportunities</li> <li>- Team cohesion</li> </ul>

*Studying the factors of formation of entrepreneurial leadership* [21, p. 243-244]. Researchers most often turn to institutional theory and single out various factors of the institutional environment as key: on the one hand, the characteristics of national culture and traditions, on the other hand, the norms that directly regulate entrepreneurial activity, form ideas in society about entrepreneurial activity, existing opportunities for starting new business. At the same time, there is an opposite point of view on this issue, which lies in the fact that, due to the specifics of entrepreneurial activity, entrepreneurial leadership is characterized by an open style, regardless of the institutional environment.

Among the factors influencing the formation of entrepreneurial leadership, human and social capital is also considered. According to the researchers, age, gender, education and work experience play an important role among the components of human capital, and social networks of formal ties, support from family and friends, the presence of mentors, mentors, interaction with people united by common interests and goals stand out from the components of social capital. experienced in entrepreneurship, overcoming challenges related to business development and leadership behavior.

In addition, more and more attention is paid to such factors influencing entrepreneurial leadership as ethics of conduct through the prism of ensuring the sustainable development of entrepreneurial leadership; features of the entrepreneurial vision of the leader and the type of organization in which this vision is embodied; hopes and expectations of leaders.

*Exploring the components of entrepreneurial leadership* [21, p. 245]. In most works, entrepreneurial leadership is considered from the point of view of the personality of the leader, which is different:

1) certain character traits: flexibility, patience, perseverance, risk-taking, achievement orientation;

2) behavioral features: openness to new experience and active search for new opportunities; lack of discomfort in conditions of risk and regarding it as a source of motivation; driven by the need to be a creator;

3) executable roles: defining a range of tasks that are realistic to perform, but are a kind of challenge (framing the challenge); limiting uncertainty by taking responsibility for the future (absorbing uncertainty); resolution of controversial issues hindering strategic development (path clearing); setting common inspiring goals (building commitment); building a common understanding and agreement on the boundaries of the possible (specifying limits);

4) approach to doing business: suggesting radical product improvements, ideas for new products, creative problem solving, passion for what you do, demanding from followers behavior that challenges the current approach to business;

5) set of competencies: technical/business skills (technical expertise, business skills); conceptual skills (analytical skills, idea generation, problem solving, strategic planning skills); interpersonal skills (empathy, team building, motivation, human resource and potential management); entrepreneurial skills (identifying and seizing opportunities, managing risk).

All these characteristics are united by the fact that they help the leader-entrepreneur to identify and use new opportunities, effectively responding to external influences and environmental challenges.

Considering entrepreneurial leadership as a command-level phenomenon, researchers pay attention to its process nature, where entrepreneurial leadership is presented as four interrelated processes: 1) the formation of a creative approach; 2) implementation of a creative approach; 3) formation of the direction of development of the company; 4) implementation of the direction of the company's development. The first two processes illustrate the process of joint actions of the leader and followers that give impetus to entrepreneurial dynamics, and the second ones are responsible for leadership dynamics and the construction of intraorganizational practices.

*Studying the relationship between entrepreneurial leadership and the performance of a firm or team* [21, p. 246]. Researchers emphasize the relationship between entrepreneurial leadership and innovative activity of employees. The authors of the studies attribute this not only to the fact that the leader is a role model in terms of applying an entrepreneurial approach to solving problems, but also to the fact that he appreciates and supports the new ideas of his employees, develops approaches that simplify the creation of innovations, identifying opportunities. Such a connection is explored as part of the process of adapting a company to changing environmental conditions, when entrepreneurial leadership becomes an integral element of exploration, which is associated with flexibility and the development of dynamic abilities.

In addition, the researchers emphasize the presence of a positive relationship between entrepreneurial leadership and the creativity of the team, which, in turn, acts as a moderator: entrepreneurial leadership has a positive impact on the com-

pany's innovative activity, expressed in the dynamics of patenting, only if the level of team creativity is high.

Entrepreneurial leadership is associated with an increase in team cohesion, especially in the early stages of team or firm development, as it contributes to the formation and maintenance of a team culture that determines the relationship between team members, response to various environmental conditions, setting and achieving goals. This leads to an increase in the effectiveness of team training.

At the company level, entrepreneurial leadership is seen as an element of the entrepreneurial architecture, which, including entrepreneurial culture, structure and strategies, promotes an increase in the level and frequency of both radical and incremental innovations. At the same time, with the growth of the dynamism of the external environment, the positive relationship between entrepreneurial leadership and radical innovation becomes stronger, while the relationship between entrepreneurial leadership and incremental innovation weakens, which confirms the special role of entrepreneurial leadership in conditions of high risk and uncertainty.

Thus, the current stage of conceptual development is characterized by a tendency to consider entrepreneurial leadership as a dynamic construct from the point of view of intra-organizational, social processes, as well as external factors and situational parameters. An important role in it is assigned to the social processes of mutual influence of the leader and followers. The concept of entrepreneurial leadership, developing at the intersection of scientific knowledge in the field of leadership and entrepreneurship, solves the problem of combining various approaches, constructs of theories of leadership and entrepreneurship, which would contribute to a better understanding of entrepreneurship, including intra-company, and, consequently, the opportunities to maintain the viability of new companies, and also creating and maintaining a high level of entrepreneurial orientation, innovation and creativity in mature companies. The design and development of the concept of entrepreneurial leadership makes it possible to make the mutual penetration of knowledge in the field of leadership and entrepreneurship more efficient and purposeful, enriching their scientific field.

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乌克兰事件背景下金砖国家在构建世界新秩序过程中的转型

## TRANSFORMATION OF BRICS IN THE PROCESS OF FORMING A NEW WORLD ORDER IN THE LIGHT OF UKRAINIAN EVENTS

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抽象的。在文章中，作者在 SMO 启动后全球一体化进程的总体趋势及其两极分化的背景下，描述了金砖国家一体化协会的历史及其演变。因此，有必要关注金砖国家内部的具体项目，特别是能源对话，并分析其进一步扩张的成果以及金砖国家自身作为构建世界新秩序的一部分的演变。

关键词：SMO、金砖国家、俄罗斯、中国、印度、能源对话、美国、IEO、MRI、联合国可持续发展目标。

**Abstract.** *In the article, the authors describe the history of the BRICS integration association and its evolution, against the background of general trends in global integration processes and their polarization after the start of the SMO. Therefore, it is important to look at specific projects within the BRICS, in particular, in the energy dialogue, as well as analyze the fruits of its further expansion and the evolution of the BRICS itself as part of building a new world order.*

**Keywords:** *SMO, BRICS, Russia, China, India, energy dialogue, USA, IEO, MRI, UN SDG.*

The existing transformation of integration associations of different levels of complexity and interdependence arises on the basis of self-identification of their national interests, their consideration in the IER and MRT, and is also based on the finiteness of the resources of each participant, which becomes a noticeable and necessary part of a single whole. At the same time, both the growing infrastructure and the divergence of various material and information flows create a unique pattern of multiplier effects that give each participant additional benefits, and its required polarization in the composition of “equals among equals” and the

additional power of the infrastructure leverage that increases the scale of changes taking place in the national economy.

The Russian SMO in Ukraine launched tectonic changes in the formation of a new understanding of the integration processes themselves, and also determined for each state its own “technical task” for implementation in the foundation of the future world order, created with the aim of not only the effective dominance of a number of leading countries or groups of ethnically oriented world order, but also like the Anglo-Saxons or the Judeo-banking loan interest rate development of the human civilization of the rental economy, but also proposed a model of conscious polycentricity of national centers of power, sovereign consensus instead of the corporatocracy uncontested dictate of global governance institutions. And the mainstream of this process lies not only within the range of expected prices for energy resources, nor in talking about the environmental problems of the planet in imposing the irresponsibly advertised chimera of the “green agenda” of the UN sustainable development goals, but in overcoming the crisis of the ideas of the spiritual-clan discourse, which is being revived within the framework of the continental bloc multipolarity. In particular, any associations of the past, conglomerates of futuristic mosaics of the geopolitical constructor become much wider and deeper than the ideas of the “sevens”, “twenties”, other gatherings and parties, the agonizing platforms of the decentralized world of the middle class and growing in terms of personal freedoms of ethnic groups, thirsting for self-determination and recognition in within Agenda 3.0. This is a solution of additive forces that are able to find in the multi-vector plane of unity in the field of civilizational and cultural characteristics, educational niches for the formation of unique competencies that guarantee the most effective application of forces from the MRI and those labor resources that can self-sufficiency in goods and services for the geographical territories of their historical residence.

Chinese history in both the SCO and BRICS makes the world think about the correctness of the path of 5,000 years, where the true values of the pantheon of the ancient gods allow the Celestial Empire to remain the world’s leading economy, lobby for its finances and technologies, which previously corresponded to the track of the Great Silk Road, and today through initiatives Belt and Road (BaR) or its duplicating version of the Northern Sea Route (NSR) water incarnation will be able to determine the growing appetites of the Arctic Council and those states that consider themselves more correctly oriented in the world of global challenges and threats. The paradox is that the American model of democracy, which has so badly damaged the states of the East and Asia over the past 70-80 years, is now ready to break the United States itself and reject the idea of a multinational cauldron, which previously attracted emigrants from all over the world, with its originality and ease of implementation. For the ideas of a society of equal opportunities without

true national goal-setting turn into ultra-right, chauvinistic and nationalist ideas, because on behalf of everyone they are fighting for the unification of everything different, often not united, for the prosperity of a minority that has lost its original meaning, usurped the right to speak on behalf of everyone for the glory of the state of slaves, fugitive convicts, adventurers of all stripes. Only the nations that created the New World are today limited not only in suffrage, but also not allowed to the heights of power, because they have restraining factors: hidden racism, segregation, disbelief in the unity of the nation, a low level of self-awareness and a degrading education that does not allow one to understand the fruits of historical of the past. And this is a consequence of the fading of imperial ambitions, unable to guarantee their self-sufficiency without new cheap labor resources, for example, from historical Africa or Asia, or by suppressing the remnants of the indigenous population living in ghettos or on reservations.

At the same time, the existing BRICS grouping (“bricks” of the future world order, Brazil, Russia, India, China and South Africa), calling for a balanced balance of power, relies on mutual planning of investments and the development of the oil and gas sector, which, as before, determines the growth of the world infrastructure and the further evolution of the resource economy. The falling volume of investments in exploration, their production and delivery to foreign consumers determines the strong influence of inflationary processes on the global hydrocarbon agenda through high prices. Therefore, convergence within the BRICS itself [1] will grow, generating flows of mutual investment in technology and financial resources for frontier or pipeline production. China, at the same time, remains a priority, overtaking India in the purchase of all fuel resources and investing more in growing production and transportation, as a geographically natural partner and co-investor of our state. And the formation of this joint energy infrastructure in the countries of cooperation is moving towards 40%, given the desire of Indonesia, Iran, Pakistan and Argentina to become part of the further integration of this format. At the same time, Brazil, together with Russia, are donors and exporters of other states in oil and gas production, and this energy balance will continue to tilt in this direction and provide a basis for the further growth of bilateral agreements that more specifically and substantively regulate the growth of cooperation between the states themselves within the framework of an expanding integration format.

At the same time, the energy dialogue “Russia - China” was launched in 2008 and was launched during the visit of D.A. Medvedev in the PRC, as a basic solution for mutual sustainable and self-sufficient development in the interests of a growing strategic partnership and neighborhood of both states through the IGC RF-PRC [2]. This has happened since 2012 and has passed the format of 4 groups (coal, electric power, renewable energy and monitoring and development of the



energy market conditions, focusing both on the BRICS zone and on OPEC policy). At the same time, our largest oil monopolists in the production and delivery of oil (Rosneft and Transneft) received a 20-year *carte blanche* for exclusive oil supplies between states [3]. The same process of convergence of efforts was continued in the alignment of efforts to analyze, develop and mutually participate in the creation of infrastructure in the Arctic zone, on the corresponding shelves and areas of oil-bearing regions.

The energy dialogue formed the basis of Russian-Chinese relations in the field of building a single energy-safe pool in Northeast Asia through the transit of technologies, finances and specific equipment for the fuel and energy complex of both states. This reduces the cost of extremely costly oil production projects in difficult-to-develop areas of the shelf and within the boundaries of the Arctic zone, while oil and gas innovations themselves and related design solutions for joint equipment increase the efficiency of mineral raw materials production for new deposits, make the Russian tool base more self-sufficient and guarantee joint scientific and technological standards for the key competencies of the post-Soviet schools of oil production, picked up and developed by China in recent years [4].

Similar cooperation is planned with Brazil [5], and in terms of gas, there are developments with India. The accession of other countries to these processes in the BRICS integration version will also enrich our scientific school and help to convergently and painlessly increase our production and sales, remove the issues of “toxicity” of our hydrocarbons from the European direction towards our new partners, strengthen their loyalty and desire to continue to build an energy dialogue within this integration community [6].

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现代信息技术在大学远程学习中的可能性  
**THE POSSIBILITIES OF MODERN INFORMATION  
TECHNOLOGIES IN DISTANCE LEARNING AT THE  
UNIVERSITY**

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抽象的。在大流行造成的限制性措施的背景下，以及根据 2019 年通过的“俄罗斯联邦数字经济”国家计划，使用远程学习技术的需求正在增加。在建议尽量减少个人接触的情况下，需要远程教育形式。引入远程学习技术需要改变教育活动的组织方式，以及熟悉拟议的数字平台和服务。

通过对市场上现有培训计划的分析，可以确定俄罗斯最多的六家 LMS 提供商：Moodle、iSpring、WebTutor、Teachbase、GetCourse。本文讨论了拟议的远程学习平台的特点和关键特征。

根据学习目标、学生队伍、拟议教育材料的特点、首选的教育方法和形式，用户可以从列出的最著名、最受欢迎和经过验证的信息平台和服务列表中进行选择。

对市场上提供的远程学习平台和服务的比较分析旨在帮助潜在用户（教育机构 and 教师个人）熟悉所提供的服务及其在教育过程中的进一步使用。

**关键词：**远程学习，远程学习技术，现代信息技术

**Abstract.** *In the context of the restrictive measures caused by the pandemic, as well as in accordance with the national program “Digital Economy of the Russian Federation”, adopted in 2019, the need to use distance learning technologies is increasing. In a situation where personal contacts are recommended to be minimized, remote forms of education become in demand. The introduction of distance learning technologies requires changes in the organization of educational activities, as well as familiarization with the proposed digital platforms and services.*

*An analysis of the existing training programs on the market made it possible to identify the six most LMS providers in Russia: Moodle, iSpring, WebTutor, Teachbase, GetCourse. The article discusses the features and key characteristics of the proposed platforms for distance learning.*

*Depending on the learning objectives, the contingent of students, the features of the proposed educational material, preferred methods and forms of education, users can choose from the presented list of the most famous, popular and proven information platforms and services.*

*A comparative analysis of the platforms and services offered on the market for distance learning is aimed at helping potential users (educational institutions and individual teachers) to familiarize themselves with the services offered and their further use in the educational process.*

**Keywords:** distance learning, distance learning technologies, modern information technologies

**Introduction:** In the context of the restrictive measures caused by the pandemic, as well as in accordance with the national program “Digital Economy of the Russian Federation”, adopted in 2019, and the “Strategy for the Development of the Information Society in the Russian Federation for 2017–2030”, the need to use distance learning technologies in universities is increasing [1, 2].

In a situation where personal contacts are recommended to be minimized, remote forms of education become in demand [3].

The introduction of distance learning technologies requires changes in the organization of educational activities, as well as familiarization with the proposed digital platforms and services.

**Purpose of the study:** The purpose of this study is a comparative analysis of the platforms and services offered on the market for distance learning.

**Material and research methods:** The subject of this work is the main platforms and services created for the implementation of distance learning. Research method: comparative analysis.

**Research results and discussion:** An analysis of the existing training programs on the market made it possible to identify the five most LMS providers in Russia.

The following comparison criteria were used to compile the analytical review:

1. Features of the system: What makes the system stand out from the rest?
2. Content support: What standards and formats of online learning content does the system support?
3. Content creation: Is there a course builder (Authoring Tool)?
4. User management: What can be done with users on the platform?
5. Reporting system: What types of reports are supported?

**Table 1**  
*Features of platforms used for distance learning*

Platform	Peculiarities
1. Moodle	Free platform with extensive customization options. Installed only on your server. There are many plugins to extend functionality. Requires web development skills for administration.
2. iSpring	A platform focused on the corporate sector. Ready to work immediately after registration. Support for all types of training materials, webinars, detailed statistics and a course editor that allows you to quickly create courses and simulators from office documents and videos.
3. WebTutor	A modular HRM platform that allows not only to build training, but also all HR processes: competency assessment, automate the selection and initial training of personnel. A complex system with a wide range of possibilities.
4. Teachbase	Cloud learning platform. There is a built-in course editor - the page with the course is assembled on Tilda, like a regular landing page. It is possible to sell courses.
5. GetCourse	The most popular platform among information businessmen. Webinars, integration with many payment systems, protection against theft of courses.

Consider the main characteristics of these platforms.

1. Moodle — is a free and open source e-learning system. Over the years of development, a strong community has formed around Moodle, which creates new modules (plugins) for the platform. A module — is a ZIP archive that, when installed on a platform, adds new features or changes the design. Today, Moodle has been translated into over 100 languages and supports over 1500 plugins.

Moodle is suitable for organizing training in universities and training centers, as well as for corporate training. Moodle is relatively difficult to set up than commercial platforms. But its administration can be more expensive, due to the involvement of third-party specialists and the maintenance of your own server. As an alternative, you can try iSpring Learn.

Moodle features:

1. Setting up the platform through plugins. The functionality and design of Moodle is changed using plugins that can be downloaded for free from the Internet or created by yourself.
2. Open source system. Anyone can develop. As a rule, plugins are developed by users themselves, and then posted on the Internet for general access.

3. Integration with other services. Moodle is easy to integrate with other platforms like WordPress or Zoom webinars.

Moodle supports the most popular e-learning standards: IMS, AICC and SCORM. xAPI (Tin-Can) support is enabled via the Logstore API plugin. You can also upload presentations, images, videos, audio and text files to Moodle.

In Moodle, you can create text lectures and polls. To create better lessons, you can use separate programs, for example, iSpring Suite. By default, users can be assigned roles and grouped into groups. All other features, such as mass assignment of courses and setting up registration conditions, are added using plugins. In Moodle, you can customize the reporting system for yourself - select only the data that is needed to analyze student performance. For example, you can see how much time they spend studying the course, how often they visit the platform, what mistakes they make in tests. The set of reports in your system depends on the plugin you install. There are 38 of them in total. For example, you can set up statistics on the progress of users and their activity, the popularity of courses, the operation of the platform (collection of errors, number of visits, etc.).

You can try the free web version of Moodle on the official website. By default, the site will offer one of two options - Mount Orange School or Moodle Sandbox. Mount Orange School - work with a ready-made educational platform with all the settings. There are even downloaded courses and bots, that is, virtual students on which courses can be tested. Moodle Sandbox is a platform that needs to be configured from scratch. You can install Moodle on your own server or try the cloud version of Moodle Cloud. The initial functionality is rather poor, so it is better to supplement it with plugins. They can be downloaded for free from the Moodle website.

2. iSpring — platform for corporate online learning. iSpring offers a complete solution for corporate online training. It includes the iSpring Learn Learning Portal and the iSpring Suite Course Builder. The solution is focused on the quick launch of online learning.

iSpring is characterized by the following features:

1. Course constructor. Using iSpring Suite, you can create educational content: courses, tests, interactive simulators and screencasts.
2. Unlimited storage. You can upload an unlimited number of files to iSpring Learn.
3. Integration with other services. iSpring Learn easily integrates with other customer systems through an open API. For example, it can be a personnel system or a corporate portal.
4. Fast platform launch. The platform does not need to be configured for a long time. It is enough to register, download courses and invite users.

You can request a trial access on the official website by filling out the form. An email will be sent to the mail with two links: the transition to the educational portal and the installer of the iSpring Suite programs. iSpring Learn supports SCORM eLearning. Courses created in iSpring Suite and published in iSpring Learn allow you to collect detailed learning statistics, as with the xApi (Tin Can) standard.

You can also upload presentations, images, video and audio files to the platform. If you want to view text files on the platform, then convert them using iSpring Flip (included in the Suite) before downloading. The volume of downloaded files, as well as the storage itself, is not limited. The iSpring Suite Course Builder is responsible for creating learning content. This is an add-on for PowerPoint that allows you to create e-learning courses from presentations. The Suite includes six modules that allow you to create interactive courses, tests, interactive simulators, video courses and books.

New users can be registered manually, automatically by a list from a CSV file, invited by email. There is also a self-registration function - an employee enters the portal, registers and takes the required course. Users can be grouped into groups and organizations, enrolled in courses and training programs, and sent messages. If you conduct face-to-face trainings, you can create an event in the calendar, and after the training, enter the results into the system.

iSpring Learn can upload 8 types of reports. For convenience, the reports are divided into groups:

- By tests, dialogues, assignments. You will find out what mistakes the employees made in the test, whether they managed to complete the interactive simulator and what seemed difficult to them in their homework.
- By users. Here you can find out which users and groups are the most active and what content they view.
- According to the materials. Here you can find out the actions performed on the material, how often it was viewed and a summary of user achievements.
- By events. Here you can find out how many events were held and who attended them.
- According to the training programs. Here you can find out how well users are doing in training programs.

iSpring Learn allows you to run a complete learning cycle:

- create training courses and enroll users on them;
- develop individual development paths for employees;
- check progress through statistics and reports;
- take into account the results of face-to-face trainings through the calendar.

3. WebTutor — an online training system developed by WebSoft, with which you can create a corporate platform for training and certification of personnel, as

well as automating HR processes. The functionality of the platform depends on the purchased modules.

WebTutor Features:

1. Setting up the platform through modules. WebTutor offers modules - separate programs with functionality. For example, there are modules for distance learning, recruitment, webinar room, chat bots. There are 12 modules in total, each is paid separately.
2. Integration with other systems. WebTutor can be integrated with the client's IT infrastructure systems: 1C, Oracle EBS, SAP HR, etc.
3. Course constructor. WebSoft has a CourseLab course builder, which is purchased separately. It can be used to create educational content.

There are two ways to try WebTutor:

1. Contact WebSoft and request temporary demo access. You will be sent a link to the portal and a distribution kit for the administrator.
2. Leave a request on the main site by clicking on the "Try" button. You will be sent a distribution kit of a trial version.

The WebTutor LMS module supports SCORM, AICC and xAPI standards.

In addition, images, video, audio and text files can be uploaded to the platform. Uploaded files will be viewable by users and can be used as course attachments, but courses cannot be assembled from them. Educational materials are created using a separate program CourseLab.

Using the WebSoft CourseLab program, you can create interactive courses, tests, and interactive simulators. If there are no functions, they can be added by writing Java scripts directly in the program. In WebTutor, users can be added to the system by importing from a file (csv, xls, txt).

New users can be divided into groups, enrolled in courses, and checked on their progress. WebTutor also allows you to create unique roles for users and set up rights for them. Roles define access to content in the system, manage other users, and configure modules.

WebTutor allows you to collect statistics on any system data and upload it in the form of a graph or table. Additionally, each module has reports that allow you to view detailed statistics. For example, in the LMS module, you can find out a report on courses, sections, employees, tasks, course goals, comments, learning dynamics.

4. Teachbase — platform for creating and selling online courses

Teachbase — web service for distance learning. On the platform, you can organize both remote training for employees and the sale of courses.

Teachbase features:

1. Integration with other systems. Teachbase can be integrated with third party CRM and payment systems.



2. Platform for webinars. Teachbase allows you to conduct webinars directly on the platform without third-party services.

You can request a trial access on the official website by clicking on the “Try for free” button and filling out the form. You can upload text documents, presentations, images, and videos to the Teachbase storage. The uploaded content is then used to create courses in the content editor. Teachbase has a built-in content editor that allows you to create tests and courses. Courses on the platform are a sequence of texts, presentations, images and videos. Users can be invited by email or imported from a CSV file. Users can be grouped and enrolled in courses. The following roles are also available on the platform:

1. Listener — regular user;
2. Mentor — assigned to the group, monitors the completion of tasks;
3. Specialist — creates courses, hosts webinars and assigns them to attendees;
4. Manager — all specialist features, plus can add other specialists to the platform. Only the manager has access to the reports.

In Teachbase, you can view statistics on users, tutorials, webinars, and activity. Reports can be downloaded in CSV format.

5. GetCourse — a service for online training and webinars, which combines a training platform, a webinar room and CRM. Using the platform, you can organize the sale of training content.

GetCourse features:

1. Sale of courses. On GetCourse, you can sell trainings and webinars, create mailing lists, and track the effectiveness of their implementation.
2. Automation of processes. GetCourse does all the hard work: reminding learners of an upcoming webinar, checking tests, and issuing certificates to users upon successful completion of the course.

You can add images and videos to trainings without conversion, as well as upload any files for download by other users. Storage size varies by subscription plan. In GetCourse, you can create trainings - tasks that can consist of text inserts, images, videos and tests (questions with a single choice). You can create profiles for users, manage their rights, view statistics on their actions.

GetCourse allows you to set individual rights for each user. For example, the rights to configure CMS, work with statistics or manage mailings. In GetCourse, you can get statistics on tasks, users, sales, business processes, website traffic. There are three types of reports: table, graph and cumulative.

The results of the comparative analysis of the platforms are presented in table 2.

**Table 2***Summary table of comparison of platforms by functionality*

Criterion	Moodle	iSpring	Teachbase	WebTutor	GetCourse
Content creation	+	+	+	+	+
Sale of courses	+	—	+	—	+
Mobile learning	+	+	+	+	+
Webinars	+	+	+	+	+
SCORM support	+	+	+	+	—
Gamification	+	+	—	+	+
Branding	+	+	+	+	+
Cloud version	+	+	+	—	+
Boxed version	+	+	—	+	—

**Conclusions:** The training systems available today differ not only in functionality, but also in what problems they can solve. Therefore, there is no universal solution on the LMS market. Each service meets specific goals: corporate training, sales of courses, distance learning in universities. To understand which system is right for you, you need to try the solutions of each provider.

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生物系在远程和全日制教育条件下使用交互式视频工作室“Jalinga”实现教育过程数字化的经验和职业指导

**THE EXPERIENCE OF THE DEPARTMENT OF BIOLOGY IN  
DIGITALIZATION OF THE EDUCATIONAL PROCESS USING  
THE INTERACTIVE VIDEO STUDIO “JALINGA” AND CAREER  
GUIDANCE IN THE CONDITIONS OF DISTANCE AND FULL-  
TIME EDUCATION**

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抽象的。在现代教育空间中，传统的教育方法和形式盛行，但在大流行期间，学生的远程学习经验被证明是无价的。这篇文章致力于一个紧迫且讨论最多的话题之一——在 COVID-19 大流行的条件下组织医科大学的教育过程。作者分享了他们在大流行期间的工作经验，这使他们能够以一种新的方式教授学生生物学。Jalinga 视频工作室的使用为职业指导和吸引医学院申请者开辟了广阔前景。

**关键词：**视频工作室、远程学习、数字化、数字化、视频讲座、职业指导。

**Abstract.** *In the modern educational space, traditional methods and forms of education prevailed, but during the pandemic, the experience of distance learning of students proved invaluable. The article is devoted to an urgent and one of the most discussed topics– the organization of the educational process at a medical university in the conditions of the COVID-19 pandemic. The authors share their experience of their work during the pandemic, which allows them to teach students Biology in a new way. The use of the Jalinga video studio opens up great prospects in career guidance and attracting applicants to the Medical Academy.*

**Keywords:** *video studio, distance learning, digitalization, digitalization, video lectures, career guidance.*

The modern world constantly poses new challenges to the mankind. The outbreak of the coronavirus infection has forced to search for a new solution to the problems of education. Since the end of March 2020, many areas of human life have changed. The uncertainty of the present and the unpredictability of the future have made to actively adapt to the new situation in all spheres, including education.

Modern students are already adapted to life in a network environment. They are able to use different types of thinking at the same time and easily find necessary information online. Moreover, they are frank, open on social media, and can independently create digital content.

Digitalization of education is the translation of information into a digital format. The use of synergetic (combined) teaching by the Department of Biology was the only way to teach students in the current conditions. The Department used the new technological capabilities of the Academy and prepared an open lecture video course and video classes on topics in accordance with the curriculum. An intelligent assistant, the interactive video studio “Jalinga” was very helpful.

The primary task for teachers was to update their own knowledge in the light of digital literacy and understanding, which is a priority. We understood that in order to create an effective digital product, it was necessary to master the principle of operation of the video studio. This new advanced equipment was devised by graduates of Bauman University. “Jalinga” is a technology that can be called a “lecture behind glass”. Students can see a lecturer who has the opportunity to show a video clip, photo, picture on the screen, to increase or decrease the object and make captions to it. Another option is the access to Internet resources during the video broadcast. After listening to video lectures, students can rewatch them as many times as it is necessary to revise the information. In practical classes, we used the standard training tables, also translating them into electronic format. Working with a microscope was a challenge in distant learning, but students could examine collections of micro and macro preparations with teacher’s comments. Undoubtedly, these tools facilitated the process of understanding the educational material, completion of tasks in workbooks and preparation for the colloquium and exam.

To communicate with students, the Department used various Internet technologies. Such technologies included: e-mail and a quick messaging system (Viber). The advantages of such communication types was the ability to keep in touch and exchange files at a convenient time for both teachers and students. Moreover, these tools allowed conducting surveys of students, adding links to lectures and practical classes to public chats, as well as interesting Internet resources. The

combination of teaching biology via the Internet-video lectures, was a huge help for both teachers and students especially when students had to do tasks in their workbooks in biology. These teaching aids covered the complete biology course in independent and classroom blocks.

In distance learning, we considered it particularly important to strengthen the role of the biological museum in mastering such section of biology as parasitology. The Department of Biology, as one of the oldest Departments at the Academy, has always been proud of the Biological museum, which was created since the first days of its foundation in 1953. The main fund of the museum has about 700 exhibits. Each item is provided with an explication in Latin and Russian. The museum's stock potential is represented by collections of the botanical herbarium, a collection of insects (beetles, mosquitoes, lice, fleas, butterflies), mollusks, sea-shells, wet preparations of birds, fish, amphibians, reptiles, mammals, dummies of fungi, plant fruits, wet preparations on embryology of development, developmental anomalies (teratology), wonderful taxidermy. Recently, two new exhibits on anthropogenesis and the structure of vertebrate skulls have appeared in the museum, made jointly by teachers and students.

The museum has become a mandatory key link in the implementation of our educational programs. For the short time the teachers of the Department created an electronic photo collection of items grouped by thematic areas, mainly in parasitology, as well as phylogeny of organ systems and embryonic development. Especially significant photo collections of preparations in parasitology are flagellated protozoa (leishmania, trichomonas, giardia), sporovics (malarial plasmodium, toxoplasma), flukes (hepatic, Siberian, Chinese, lanceolate). There is a rich exposition of tapeworms (bovine, pork tapeworm, broad tapeworm, echinococcus - tapeworm and larval forms), as well as roundworms (ascaris, pinworm, trichinella, whipworm). The collections of arthropods that are of medical importance (ticks, spiders, lice, fleas, gadflies, flies, mosquitoes) are also numerous. We also had the opportunity to develop a series of thematic virtual excursions to the Department-Museum to use them in the educational process, as well as the possibility of conducting pre-examination consultations. In the process of work, we were constantly interested in our students' opinion and took into account their suggestions.

The tandem of the biological museum and the resources of the interactive video studio "Jalinga" in distance learning allowed to introduce elements of gamification, make learning more accessible and interesting and reduce the spatial distance between teachers and students forced by the pandemic. We had the opportunity to qualitatively improve Biology teaching, formed general cultural and professional competencies, and implemented the State Educational Standard in the specialties "General Medicine", "Pediatrics", "Dentistry".

The Education Committee of the City District Administration “Chita City” initiated the project “Developing Saturdays for Chita Schoolchildren” in order to expand the range of possibilities of the interactive video studio Jalinga to familiarize the young generation with the strategies of modernity, stimulate the interest of potential applicants to study and research and contribute to the formation of a high cultural and intellectual level of adolescents and youth. Within the framework of this project in the autumn 2021 Chita State Medical Academy took an active part in the event “Medical Saturday”, in order to promote a healthy lifestyle, prevent morbidity, and get acquainted with the specifics of the doctor’s profession.

Professional orientation is a generalized concept of one of the components of universal culture, manifested in the form of public concern for the professional development of the younger generation, support and development of natural talents, as well as a set of special events to assist a person in professional self-determination and choosing the optimal type of employment, taking into account his needs and opportunities, socio-economic situation on the labor market. In the Trans-Baikal Territory, the problems of youth career guidance are particularly significant. This is due to the geographical location of the region, its economic development and many other aspects. the Ministry of Education of the Trans-Baikal Territory regularly notes that there are not enough subject teachers in the region’s schools and that the need for them is only growing every year. For comparison, in the 90s and early 2000s, on average 45 Biology and Chemistry teachers graduated from Chita Pedagogical Institute (nowadays it is Zabaikalsky State University, ZabSU). In recent years ZabSU has graduated no more than 10 bachelors, of whom almost no one worked as a teacher. The shortage of subject specialists directly affects the number of applicants planning to take the Unified State Exam in these subjects, as well as the quality of the results obtained. Long-term exam results show that the farther a school is from the regional or district center, the more difficult the situation is.

In the conditions of COVID-19 in all spheres of our life, we had to adapt to the new situation. The career guidance work at the Department of Biology was no exception. Previously, the staff of the Department, in addition to their main work in the Center of Pre-university Training, were actively engaged in career guidance work with applicants of the Trans-Baikal Territory. In conditions of quarantine, self-isolation, distance learning, many previous forms of work were unavailable. The teachers of the Department had to reconsider their approaches to this type of activity.

The staff of the Department joined the project “Children’s Scientific Collaboration” (ChSC) with ZabSU scientists-teachers. This project is aimed at creating conditions for improving the quality of education for schoolchildren through the implementation of additional educational programs that meet the priority areas

of scientific and technological development, including biology. The project is aimed at creating an environment for accelerated development of children, which will allow them to build their own development trajectory, determine their future profession through career guidance. It creates equal opportunities for schoolchildren from the city and the region who are interested in obtaining knowledge in the natural science field, those who attend schools where there is a shortage of Biology teachers. The project provides school Biology teachers with advisory, informational and methodological support from the teachers of our Department. Intensive biology course, implemented within the framework of the ChSC project, is aimed at expanding the horizons of children, they are given the opportunity to get new knowledge, new acquaintances, new impressions and an incentive to get the desired profession for free. Intensive biology course lectures are given for the residents of the collaboration, as well as videos with lectures and instructions are recorded. They also can have entertaining laboratory classes both online and offline. The residents of the collaboration and young teachers have individual consultations as well.

社会康复中心未成年人的社会适应  
**SOCIAL ADAPTATION OF MINORS IN A SOCIAL  
REHABILITATION CENTER**

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抽象的。 本文介绍了属地社会康复中心未成年人社会适应的措施。 以及未成年人社会康复中心学生社会适应水平的诊断。

关键词: 未成年人, 社会适应, 未成年人社会适应水平诊断。

**Abstract.** *The article presents measures for the social adaptation of minors in the territorial social rehabilitation center. And diagnostics of the level of social adaptation of pupils of the social rehabilitation center for minors.*

**Keywords:** *Minors, social adaptation, diagnostics of the level of social adaptation of minors.*

Social adaptation is one of the most important aspects of the process of socialization. But if socialization is a gradual process of personality formation in certain social conditions, then the concept of “social adaptation” emphasizes the active development by a person or group of a new social environment in a relatively short period of time.

The relevance of this work is due to the fact that many adolescents living in a social rehabilitation center are from dysfunctional families, orphans and children left without parental care. They are often deprived of normal living conditions, food and behavior skills in a team. Some pupils are distinguished by deviant and delinquent behavior, are registered in juvenile affairs.

Social adaptation, according to A. A. Nalchadzhyan, is a socio-psychological process, as a result of which a person comes to such relationships in which a person, without prolonged external and internal conflicts, productively performs his leading activity, satisfies his basic social needs, justifies role expectations, present-



ed to him by society, experiences a state of self-affirmation and freely expresses his creative abilities [3].

From the point of view of the author Kholostova E.I., social adaptation is mainly associated with psychosocial phenomena. Social adaptation includes aspects related both to the self-activation of the individual, as well as to the involvement in this process of a complex of activities of a different nature [11].

The social rehabilitation center for minors is an educational institution of the state system of social protection of the population, providing social assistance to minors with various forms and degrees of maladjustment, including such children who find themselves in difficult life situations, and also accepts children who have been left without parental care.

Under the social adaptation of the child is understood as the process of his active adaptation to the conditions of the social environment; type of interaction of the child with the social environment. Social adaptation can be active (when a person seeks to influence a new social environment for her) and passive (if a person does not influence the environment, but obeys its norms, public and unspoken rules). The content of social adaptation and an indicator of its success is the child's assimilation of norms, rules of behavior in society.

Analyzing the pupils of the social rehabilitation center as an object of research, we can draw the following conclusions. Juveniles are characterized by the following psychological characteristics that determine their overall victimization, in terms of predisposition to commit a crime and the emergence of social problems:

- increased suggestibility, which contributes to the emergence of behavior based on someone else's system of value orientations;
- psychological dependence on the objective world, things can make teenagers dependent on donors, induce envy and aggression;
- exposure to special teenage stereotypes that have external manifestations;
- negativism, demonstration of independence can induce minors from outwardly quite prosperous families to anti-social behavior (minors have a desire to do "against" their parents, to prove their "adulthood" and independence from them). Moreover, teenage negativism, rudeness, stubbornness are a kind of protest against the dominance or indifference of adults who do not want to reckon with the increased level of claims of minors. This leads to the fact that the teenager finds an environment that is comfortable for himself, in which his desire for "adulthood" is accepted, and if this environment is antisocial, then the teenager acquires the corresponding personality orientation. Thirst for adventure, curiosity inherent in minors can provoke the commission of a crime by persons of this age category due to the "infection" with criminal romance.

Therefore, the assessment of the level of social adaptation of adolescents is an integral part in the process of socialization and social rehabilitation of minors.

Based on the foregoing, in order to assess the degree of social adaptation of minors, we conducted a study on the topic “the level of social adaptation and knowledge about a healthy lifestyle among minors living in a social rehabilitation center”. The purpose of the study is to determine the level of adaptation and awareness of the principles of a healthy lifestyle among pupils of the Social Rehabilitation Center aged 13 to 18 years, to identify possible risk factors and bad habits. The study of the level of social adaptation of pupils makes it possible to determine the degree of adaptation of minors, contributes to the correct distribution of resources necessary for the social adaptation of pupils, the preparation of both individual and group programs and classes with minors.

The main objectives of the study are:

- to analyze the features of social adaptation of orphans and children left without parental care.
- to measure the level of social adaptation of pupils of the Social Rehabilitation Center.

The level of social adaptation of the pupils was assessed by questioning on 9 questions, including educational, everyday, socio-psychological, social adaptation itself. Each question is rated on a scale of 0 to 3, depending on the success of adaptation. The overall fitness criterion is the arithmetic mean of all nine scores.

With its values ranging from 2.5 to 3, a high level of social adaptation is postulated, with values of 2–2.4, an average level of adaptation, ranging from 1.5 to 2, problematic adaptation is diagnosed, and below 1.4, disadaptation.

The study was conducted on the basis of the GKUSO SO of the Social Rehabilitation Center for Minors of the Nizhneserginsky District. The respondents for the study included 15 pupils of the center aged 13–18 years.

The first diagnostic question was devoted to social status. Of the 15 people, only 20% of minors have good academic performance, they attend classes, do not miss classes without a good reason, and show interest in learning. They study hard, do not always cope with the program, sometimes miss classes, mainly study with the assistance of external control of 50% of the respondents. Also among the respondents there are pupils who study poorly, do not keep up with the program, constantly miss classes, study only with constant external control, this category is 30%.

The second question of the questionnaire characterized the features of communication with teachers. There are difficulties in communicating with teachers. 40% of respondents have comments on academic performance and behavior; 30% of minors are in conflict with teachers. A law-abiding study showed that adolescents have illegal behavior. 20% of minors have antisocial behavior (fights, foul language, rudeness, etc.), 10% have committed illegal acts and have been brought to administrative responsibility. 70% of pupils consider themselves law-abiding.

Features of the state of health of adolescents. Among the studied adolescents, 75% are practically healthy, 25% of adolescents have frequent somatic diseases. Among the respondents, with neuropsychiatric diseases or disabilities were not identified.

The structure of the features of communication with relatives is presented as follows. 65% of adolescents have comments on behavior, communication with relatives, conflict situations, manifestations of aggressiveness towards people around them. In conflict with loved ones, there are 35% of adolescents, these are pupils from dysfunctional families, orphans and children left without parental care.

With the help of the questionnaire of social adaptation, a diagnosis of such criteria as the presence of bad habits, the presence of plans for the future, and the general emotional state was also carried out. A study of the presence of bad habits showed that 65% of respondents do not have bad habits, 35% of adolescents at the age of 15-16 first used light alcoholic beverages and cigarettes. Pupils who constantly consume alcoholic beverages, drug addicts, were not identified.

A study of the availability of plans for the future showed that 60% of students have real plans (obtaining a specialty, housing, starting a family, etc.). 30% of adolescents have situational plans (get married, earn a lot of money, etc.). The concern is that 10% of students have no plans for the future at all.

A study of volitional control of the subjects showed that out of 15 adolescents, only 55% of students are able to make decisions on their own and achieve their goals. Try to listen to close adults, 40% of teenagers. Also, among the respondents, 5% are easily influenced by bad influences and need constant monitoring.

Diagnostics of the emotional state of adolescents living in the center showed that a stable emotional state is observed in 45% of adolescents out of 15 people in this study. Frequently changing mood, low mood is observed in 55% of adolescents. No emotional disturbances were found among this group.

The results of the study of the level of social adaptation of adolescents. A high level of social adaptation was not revealed, 55% of adolescents have an average level of social adaptation (problem adaptation), 35% have a low level of social adaptation, and 10% have maladaptation.

When assessing awareness of a healthy lifestyle, we concluded that the pupils are not sufficiently familiar with the principles of a healthy lifestyle and do not fully objectively assess its significance in everyday life, since 35% of 15 people have bad habits, smoke or drink alcohol. Also, only 30% of respondents have any hobbies (sports, music, dancing). 50% of adolescents believe that physical education and sports and personal hygiene do not affect the formation of a healthy lifestyle. 30% find it difficult to answer, and only 20% believe that personal hygiene and sports or physical education are an integral part of a healthy lifestyle. When asked if information about a healthy lifestyle is interesting, 70% of adolescents answered that it is interesting, 20% are not interested, and 10% find it difficult to answer.

The results of the study showed that the surveyed adolescents have a predominantly average level of social adaptation, which manifests itself in relationships and communication with teachers, relatives, the use of tobacco and alcohol products, skipping classes, a passive life position and lack of self-confidence.

Also, when analyzing the survey on awareness of the principles of a healthy lifestyle, we can conclude that the level of knowledge of adolescents about a healthy lifestyle is not at a very high level, but most respondents are interested in this information.

The average level of social adaptation and awareness of the principles of a healthy lifestyle is primarily due to the fact that most adolescents lived in dysfunctional families, were in a difficult life situation and did not have a positive example of building relationships in society. Some of the respondents have been living in the social rehabilitation center not so long ago and still cannot fully adapt to the new requirements and living conditions, as well as to life in a team, despite the classes being conducted by the center's teachers and psychologist. Due to teenage immaturity and tendency to deviant behavior, this category of minors is emotionally vulnerable, which causes difficulties in the process of their social adaptation. Therefore, from the point of view of the age characteristics of pupils, in this period of time it is important for them to communicate with peers in confidence, exclude interpersonal conflicts, engage in personal communication with teachers, organize leisure and recreation, search for an interesting hobby or hobby, emotionally - positive perception of the system of their relations with teachers, peers and loved ones.

Therefore, in order to increase the level of social adaptation and knowledge about a healthy lifestyle among the pupils of the social rehabilitation center, we developed and conducted an interactive game "I protect my health".

An interactive game on a healthy lifestyle, designed for the work of a social worker during group classes with the pupils of the center, assisting them in adaptation issues.

The purpose of the interactive game is to increase the level of social adaptation and knowledge about the principles of a healthy lifestyle among pupils of the Social Rehabilitation Center for minors aged 13 to 18 years.

Game objectives:

1. Formation of personal qualities of minors necessary for successful interaction in society;
2. Development of skills for constructive and non-aggressive relationships and communication with friends and in society;
3. Formation in adolescents of a sustainable orientation towards a healthy lifestyle and the implementation of preventive work on the use of alcohol and tobacco products.

Program implementation:

Interactive game is designed for 1.5 hours. Includes 2 stages: theoretical and practical, as well as a questionnaire for evaluating the effectiveness of this game. Number of participants: 10-12 people.

The main stages of the game:

1. Theoretical stage. At this stage, it is supposed to provide information about the principles of a healthy lifestyle and the consequences of having bad habits in a healthy person.
2. Practical stage: consolidation of the received material through an interactive quiz with 10 questions. Formation in adolescents of a sustainable orientation towards a healthy lifestyle and the implementation of preventive work on the use of tobacco and alcohol products.

When re-questioning the pupils of the center, we found out that the majority of minors were interested in the game and liked the way information was provided. Also, the criterion for the effectiveness of the game was positive changes aimed at preventing bad habits and abandoning them. Since the majority of pupils believe that they will be able to give up bad habits in the future.

And so from the behavioral study it follows that the conduct of an interactive game aimed at the formation of a healthy lifestyle of adolescents has a positive effect on the attitude of adolescents to a healthy lifestyle. It also contributes to the development of sociability of minors when communicating with peers and teachers.

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俄罗斯在乌克兰的 SMO 对欧洲美国化的影响以及俄罗斯在构建多中心世界中的作用

**INFLUENCE OF RUSSIA'S SMO IN UKRAINE ON THE  
AMERICANIZATION OF EUROPE AND THE ROLE OF RUSSIA IN  
BUILDING A POLYCENTRIC WORLD**

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抽象的。这篇文章的作者认为，忽视美国全球霸权程度的下降是毫无根据的，并考虑了以牺牲卫星国家为代价的进一步殖民统治的威胁和挑战，这些卫星国家能够在多中心和多极世界中获得独立。给出了关于俄罗斯的 SMO 作为美国在旧世界不断扩张的触发器和催化剂的观点。

关键词：SMO、人工智能、大数据、俄罗斯、中国、美国、金砖国家、上合组织、欧亚经济联盟、马歇尔计划、门罗主义、工业 4.0、第七次科技秩序、WME、空间。

**Abstract.** *The authors of the article consider the groundlessness of neglecting the falling degree of American global hegemony and consider the threats and challenges to further attempts at colonial domination at the expense of satellite countries that are able to gain independence in a polycentric and multipolar world. The views on the SMO of Russia as a trigger and catalyst for the ongoing expansion of the United States in the Old World are given.*

**Keywords:** *SMO, AI, BIG DATA, Russia, China, USA, BRICS, SCO, EAEU, Marshall Plan, Monroe Doctrine, Industry 4.0., 7th scientific and technological order, WME, space.*

In the modern world, the role of scientific and technological progress aims to create the necessary structure for the effective development of the state, taking into account the specialization of the appropriate staffing for Industry 4.0, the upcoming 7th scientific and technological order [1]. It is the speed of convergence of science, education and applied development of weapons and military equipment (WME), space systems for satellite communications, communications and remote sensing of the Earth (ERS), as well as the presence of a national stable element-component base that allow each state to be a member of various cooperative communities and scientific schools, aggressively or dependently participate in post-COVID waves of mergers and acquisitions, choose for themselves the appropriate uniqueness and specialization when forming strategic alliances [2].

National security issues do not tolerate maxims, populism and demagoguery, they are full of specific steps and targeted tasks to be solved by specialists of the appropriate degree of training, the level of their competence involvement in various trajectories for the formation of priority goods and services for special, dual or military purposes, constantly monitored in the annual lists of the relevant departments. For only strict accounting and continuity in following breakthrough, supporting and critical technologies can outline a clear landscape of our self-sufficiency or reveal our hopeless backwardness, as happened with the technological structures of the atomic nucleus and the atomic plane, which we simply could not finalize in the “wild nineties” and later at the proper level, minimizing both scientific groundwork, and not building specific production and design solutions, which today have been unified and adopted by the entire modern scientific world as basic tools and applications in control, analysis and measurement devices. In fact, this delay has narrowed the Russian scientific tools and implementation potential by tens of percent and made us partly technologically dependent on those who have put into circulation everything related to the technique of detecting and studying the dimensions of the angstrom-nuclear and nanolevels. The same metamorphoses have taken place in global circuitry, and in printing circuit boards of the appropriate level and size, as well as the required placement of a sufficient number of components on one conditional surface element, which are equally used in the electronic brains of modern cars, and in ultra-high-speed computer calculations and in those the same samples of WME, which today we can talk about with further advances and breakthroughs in the field of hypersound and high-precision weapons. The boards themselves left Russia at the level of 90% and their delivery from Taiwan has not yet been fully resolved. And the disruption of production



supply chains and scientific cooperation in the context of sanctions restrictions after the start of SMO by Russia in Ukraine, the introduction of retortions and reprisals, personal, corporate and sectoral sanctions of targeted containment and blocking from the assets of the property complex to the imposition of autarchy of access to intellectual producers slowed down the pace of our scientific inclusion in global projects. And the ban on the use of information from some WIPO institutions to elementary journals of scientific and popularization properties (most of them “suddenly” left Russia or lost their former name and owners, as the basic elements of a unified mutual international monitoring of the backlog of scientists, designers and technologists in the field of neural networks, artificial intelligence (AI) and analysis of big data bases (BIG DATA) [3], previously produced by representatives of the “golden billion” countries in Russia in search of collecting and isolating alternative and unique knowledge of domestic science. The Russian possible scientific reaction, in part, could be called panicky and chaotically provoked by the challenges of our former partners to withdraw from various projects in space or in genetics, for example, because engineers, technologists and designers are again returning to the time of the Jackson-Vanik amendment, multiplied with positions of unprecedented pressure on the best minds of the Russian scientific community, but the enthusiasm from attempts at such unceremonious disrespect for everything Russian cemented our society, gave it the idea of an ideology of unity in patriotism and self-sufficiency. Moreover, there is nothing to condemn our unique luminaries, because the amount of bureaucratization of their work, delaying the purchase of equipment and reagents was red tape, vigils for weeks and months in anticipation of foreign supplies, which could not but affect our competitiveness compared to foreign research centers. And the conflict of this imperfect evolutionary scientific reserve under the sanctions pressure has a clan-personal character, and the ministries involved in the policy of import substitution with a number of universities are building their own separate citadel of scientific sovereignty in the context of an aggravating systemic crisis, without specific profile or intra-company guidelines for scientific criteria for coexistence for the entire research community.

Similar trends, only with other actors, can be observed today in the Old World, where Europe, deprived of a sufficient amount of cheap energy resources, instead of accelerating in the innovative breakthrough of NBICS technologies [4], is forced to deal not with “green”, but with coal and wood, the very real carbon-oriented, energy. And this means that the Marshall Plan 2.0. to create a quasi-state of the United States of Europe on the basis of a single European space, by putting Lenin’s idea into practice of global reformatting of the world order, due to the results of SMO and the ongoing proxy war, it will be able to kill several birds with one stone: 1) remove the “locomotive” of the EU” – Germany with its “hidden

champions”, by militarizing it, while squeezing it out of its unique, truly German competitive innovation sphere, and allowing the launch of privatization processes under the pressure of changing the pro-NATO priorities of the remnants of European science to the tasks of the Anglo-Saxon military-industrial complex and space (for this action, the Great Britain was theatrically released on free bread, allowing it to play the role of the leader of American interests in matters of uniting the global agenda of neocons and Atlanticists; 2) remove from the agenda the idea of E. Macron and A. Merkel about an independent and self-sufficient European army, free from NATO and American domination; 3) to launch the flywheel of the leading 4 US companies after the Afghan failure and the Ukrainian booth at full capacity, increasing the capitalization of these TNC, and receiving the required 2% to the NATO fund, consider the US itself, to ensure future European security; 4) transfer sufficient European-American military contingents and renew the military resources imported from overseas to the old and newly opened NATO military bases - specialized camps of the “American way of life”; 5) also involve Sweden and Finland, as two new members of the North Atlantic Alliance (31st and 32nd members), to develop new confrontational zones of contact with Russia and strengthen the protection of the Baltic states, those who have long lost their national sovereignty and live by being involved in Russophobic programs, participating in activities to provide the NATO military with its infrastructure for their “potential protection” from Russian invasion; 6) to cause panic among European burghers, first from the waves of Afro-Eastern consequences of the “democratic springs” and the Igitel revelry of enclaves that are not implemented in the policy of multiculturalism to solve the problems of “demographic winters”, and now from the Ukrainian criminalization of national remnants of the chauvinist and pro-fascist persuasion, replacing them with their own by migration flows under the guise of refugees, the already prepared consciousness of the European layman from the cliché of the “Russian mafia” to the new threat of the “criminal Slavic octopus” of the poorest country in Europe; 7) create a protracted conflict between the EU and Russia as a civilizational fracture of the emerging structures of Eurasianism; 8) bring the US-controlled oil and gas-bearing countries to the European oil and gas market through the use of schemes for a possible “Russian occupation” and “coming famine and cold” of the barbarian tribes of the East (gradually, propagandistically, first the PRC will be dragged to the East, and only then, in the case of disobedience to the policy of the Anglo-Saxons and India itself, which, as before, is part of the intelligence collection system of the community of countries of the pro-American development vector); 9) speed up LNG deliveries from the USA in case of price drift from the Asia-Pacific region towards Europe from the standpoint of their multiple increase; 10) deploy, under the guise of monitoring the growing isotherms of the Paris Agreement [5], an analysis of the actions of envi-

ronmentally polluted industries, including US-controlled LNG production already on the territory of Europe itself, to localize harmful and toxic zones in places of unauthorized opposition to US ambitions on the continent and the management by American advisers of “environmental valve” for the prepared potential explosion of the situation among more than half a billion of the population of the EU due to the manipulation of the old pre-industrial backlogs of the former CMEA countries [6], which, due to their marginalization and amorphousness, are unable to build mechanisms to counteract American dominance in their states. And these points are only the visible part of the iceberg, allegedly “melting before our eyes” of the base of American post-colonialism in the Old World from the standpoint of the growing concentration and redirection of the main efforts to the eastern vector of the Asia-Pacific region by creating new alliances like the AUCUS or the planned Asian NATO.

It is not true to think that the era of American exceptionalism is waning, the empire is degrading and disintegrating, and Joe Biden himself is becoming a parody of himself in many of his speeches and actions. All this is taking place: both the reduction of world settlements for energy resources in US dollars, and the lack of desire on the part of OPEC to collude with the Americans, as it was fatally demonstrated during the Cold War and accelerated the collapse of the USSR (although the current unwillingness to take into account the requests of the American politicians lead to the fact that the head of OPEC “as if ordered”, dies suddenly at the age of 63), and the Japanese guru of the policy of compromise with Russia and miracles of the growth of Abenomics, Shinzo Abe, dies at the hands of a lone maniac...

At the same time, Ramzan Kadyrov’s trip to the Kingdom of Saudi Arabia on Eid al-Adha before the US President’s tour speaks of the methods of “shuttle diplomacy”, introduced earlier by Henry Kissinger and already included in the classics by constantly building up pictures of the imperfection of the geopolitical aspirations of the Monroe doctrines and breakthroughs of isolationism through a set of neocon steps attempts, desiring further world rule by all the stars and stripes of the establishment of the free world. And no matter what happens, everything will be taught to the world in the form of a ready-made Big Brother’s decision to save the world, and the role of everyone else will be reduced to the bad guys from the famous Gaidar’s work and the ungrateful usurpers of the ideas of “universal equality” and the “strategy of human values.”

The true vision of such behavior of all the defendants is ideologically framed in the search for a compromise on the search and building of multipolarity, and in fact, there is a correction in the asset management system being updated by the United States, after falling income from existing colonies in their post-COVID recovery. At the same time, the beautifully advertised exits from the Russian

market by hundreds of Western companies do not lead to the total and expected nationalization of assets, the country's exit from the WTO, the growth of new jobs and the initially planned total industrialization of the information type society, but, on the contrary, there is a drop in the level of technology and science, there is rising inflation and multimillion-dollar unemployment cannot yet resolve at new points of possible growth, which leads, among other things, to a reduction in Russia's GDP. It turns out that the idea of freeing the Russian economy, almost completely captured by global TNCs [7], leads to a modest choice with solutions that are less significant for the real tasks of scientific and technological progress, yet alternative, but difficult and long-term implemented friendly import substitution [9], without switching to mobilization regime with "self-reliance" and the impossibility of dialogue with various leading eastern companies capable of closing the gap in the field of NBICS, and assisting and maintaining the falling standard of living, and creating truly significant production on the abandoned work sites of departed foreign companies with markets potential sales in the BRICS and Asia-Pacific countries.

It remains to wish the State Duma of Russia, which is going on vacation, to consider plan "B", when the Americans stop making everyone laugh with the odious and lowest-rated President of the United States in recent decades, the whole world, but they will be able, as if by magic, to get Captain Hook and transfer the theater of operations to cyberspace or to the starry distances, which will suck up the remnants of our resources and exclude the possibility of becoming part of the world scientific community. The President of Russia, as a politician playing for the long haul, certainly assessed the risks of both technological slavery and the personnel gap of second-tier Russians (when the number of industries in the state cannot be served by the available local personnel, but only with the help of expats or friendly scientific schools of import substitution), and resource and raw material dependence, which is declining, but accounts for more than half of the assets in the hands of foreign TNCs, can and will definitely take drastic steps to counteract further colonial development for the former post-Soviet society, which is now leaving power (these are both baby boomers and generation X " ") and will create all the necessary conditions for the consensus of scientific schools, and an accelerated farewell to the Bologna process of pumping young talents out of the country, and will introduce a system of coordinates where our answers will not be linear, and only controlled by us, and as effective as possible from the standpoint of the imperial revival of the Russian state, forecasting and development Eastern partnership within the framework of the SCO and BRICS, the single sovereign space of the EAEU.

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全球化和区域化趋势：对现代国家联邦结构的科学理论和实践的影响（政治和法律研究）

**TRENDS TOWARDS GLOBALIZATION AND REGIONALIZATION:  
INFLUENCES ON THE SCIENTIFIC THEORY AND PRACTICE  
OF THE FEDERAL STRUCTURE OF THE MODERN STATE  
(POLITICAL AND LEGAL RESEARCH)**

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**摘要：**本文基于对俄罗斯和外国作者关于“全球化”、“区域化”、联邦制、联邦化等主题的大量科学出版物的概括，这使得确定两者之间的关系（相互影响）成为可能。相关工艺的发展趋势。考虑以下问题：区域研究的科学理论的发展和联邦主义科学理论研究的新方法的发展，同时考虑到联邦制的统一和国家形成的本质；关于国际法宪法化的概念。

**关键词：**区域，区域主义，国际区域化，州内区域化，全球化，联邦制，联邦，联邦化，一体化国际协会，国际组织，联邦形式的政府，宪政，宪政，宪政经济。

**Abstract:** the article is based on a generalization of a wide list of scientific publications by Russian and foreign authors on the topics of “globalization”, “regionalization”, federalism, federalization, which made it possible to identify the relationship (mutual influence) of the development trends of the relevant processes. The following questions are considered: the development of the scientific theory of regional studies and the development of new approaches to the study of the scientific theory of federalism, taking into account the unifying and state-forming essence of federalism; about the concept of constitutionalization of international law.

**Keywords:** region, regionalism, international regionalization, intrastate regionalization, globalization, federalism, federation, federalization, integration international associations, international organizations, federal form of government, constitutionalism, constitutionalization, constitutional economy.

According to many researchers (Russian and foreign), since the 90s of the XX century. One of the leading trends in the development of the world order is the trend towards regionalization, which distinguishes between international (trans-

national) and intrastate interregional directions of integration. The corresponding processes in scientific publications are assessed as competitive (alternative) to the aspirations for universal (planetary) globalization, and also reflect the commitment of national states to the preservation of state sovereignties, state constitutional identity, and the preservation of the national and cultural identity of their peoples. At the same time, the expanding processes of interstate regional integration are relevant in the same way as the natural needs of national states to cooperate on a permanent (long-term) basis in the conditions of limited natural resources of the planet, for the purpose of cultural exchange, and other factors.

In connection with the expanding practice of regionalization, a doctrinal understanding of the processes of international and domestic regionalization is also developing. In Russia, research into the processes of globalization and regionalization is carried out from the standpoint of various branches of science: economic, political science, legal, sociological, historical, the science of international relations, cultural studies, the science of state and municipal administration, etc.

In Russia, the corresponding processes of regionalization are studied in great detail by the scientific school of the Institute of International Relations (University) - MGIMO<sup>1</sup>. Experts note that in practice there is a “dynamic development of international processes at the regional level, various trajectories of regionalization in Europe, Asia, Latin America and other parts of the globe”<sup>2</sup>. Based on a review of publications by foreign researchers and materials of international conventions, in an article by Russian author E.V. Koldunova notes that a “general context for the analysis” of a new “significant phenomenon” has been formed in science: the emergence of the so-called “regional worlds”, the diversification of international processes in connection with the formation of more interconnected regional spaces (in other terminology, “regional complexes” or “integrated actors of the world politics”), refracting global processes in their own way and generating specific types of international interaction”<sup>3</sup>. At the same time, assessing the state of research on regionalization processes, E.V. Koldunova cites the opinion of foreign authors that: “in the social sciences in general and the science of international relations, in particular, a distinct dominance of the Western-centric approach remained, that the realities of non-Western countries were not taken into account by researchers, and a certain information and analytical gap in this regard is still preserved”<sup>4</sup>. Meanwhile, the opinion is correct that it is necessary to intellectually comprehend the huge array of empirical material regarding non-Western integra-

<sup>1</sup> See: East/West: Regional Subsystems and Regional Problems of International Relations. Textbook / Edited by A.D. Voskresensky. — M.: Moscow State Institute of International Relations (University); Russian Political Encyclopedia (ROSSPEN), 2002. - 528 P.

<sup>2</sup> Koldunova E.V. World integrated regional studies as a research approach and academic discipline

<sup>3</sup> Koldunova E.V. Spec. article.

<sup>4</sup> Koldunova E.V. Spec. article.

tion international associations, since “the emergence of such new international groupings as the BRICS and the economic rise of some Asian countries (primarily China and India) led to the formation of a polycentric structure of international economic relations, which in the future may have an ever-increasing influence on the political component of these relations”<sup>5</sup>. Russian specialists emphasize the importance of carrying out a comprehensive study of the international segment of international integration processes.

In the context of trends towards globalization and regionalization, issues of federalism as a principle of state structure are also the subject of active discussion in the scientific literature in the designated period (since the 90s of the XX century): quite a lot of publications devoted to the historical aspect of federalism in various countries, comparative studies, analytical developments of a general theoretical nature<sup>6</sup>. The issues of new federalism are mainly studied in the context of such scientific areas as: political science, general theory of state and law, constitutional law, international law, budgetary and tax law, economic and historical sciences. Among the reasons for the intensification of research on federalism issues, researchers name the following: that it is not only “a mechanism for the division of state power between several subjects in a certain territory”, but also due to the fact that federalism is a process that is in a state of its constant evolution<sup>7</sup>; can be defined “not only as a certain structure of state bodies and their hierarchy, but this and that “a constant process of settling relations between the central government and the constituent parts of the federation”<sup>8</sup>.

As the Brazilian authors P. R. B. Ramos and P. N. M. Viana rightly point out: “Federalism is now considered a fundamental principle”<sup>9</sup>. In the context of the research topic in this article, it is interesting to note that a new scientific approach to the study of federalization processes is being formed, reflecting new practical trends associated with the processes of globalization and regionalization. In particular, according to co-authors from Penza State University O. Plotnikova and O. Dubrovina: “Regionalism plays the role of the main driving force in the process of transforming unitary states into federal ones, and within the framework of newly emerged federations, to a large extent acts as a determining force for the further

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<sup>5</sup> Koldunova E.V. Spec. article.

<sup>6</sup> According to A.G. Bolshakova: “The renaissance of federalism begins in the 50s of the XX century” // The fate of federalist projects in the post-Soviet space / *Politiya*. 2007 №1(44) P.113

<sup>7</sup> P. R. B. Ramos, P. N. M. Viana. Federalism. The origins and ways of its development in the history of the United States and Brazil. Federal University of Maranhao, Sao Luis, Maranhao, Brazil // *Branches and Institutions of the Law./ Pravosudie/Justice*. V. 3, no. 2. 2021. Original Papers. P 62-79

<sup>8</sup> Makeeva N.V. Gulyakov A.D. Federalism as a tool for sustainable development of statehood: theoretical analysis // *Bulletin of the Tambov University. Series Political sciences and law*. 2016. V. 2, Iss. 3 (7). P.

<sup>9</sup> P. R. B. Ramos, P. N. M. Viana. Spec. works. P.62



evolution of federal relations”<sup>10</sup>. In other Russian publications, the “author’s position on the state-forming nature of federalism, stemming from its unifying essence” is not unreasonably substantiated<sup>11</sup>; or the concept of federalism is linked to the “emergence and formation of the state in its modern sense”<sup>12</sup>. In particular, in Russian science devoted to a review of scientific concepts about the prospects and trends in the development of intrastate and interstate relations, the following assessment of the state of theory and practice is given: “In unitary states, under the influence of federalism, processes of decentralization arise. Hence, naturally, the emergence of states occupying an intermediate position between a federation and a unitary state (regionalist state). Such states can be called semi-federations or quasi-federations - unitary states with pronounced elements of federalism. Elements of federalism are used both as a basis for the formation and development of local self-government, thereby expanding its potential, and as a necessary element of interstate relations and the formation of confederate entities with pronounced elements of a federal structure (European Union)”<sup>13</sup>. From time to time in journalism, and, sometimes, in scientific publications, the concept of “global federalization” is also mentioned - federation as a possible form of unification of the states of an entire continent (United States of Europe) and even the planet as a whole (World Federation)”<sup>14</sup>. A.G. Bolshakov writes about the objective contradiction of world development, which consists in the fact that: federalist institutions and practices are found, in addition to Europe, “in the countries of South and North America, Asia, Africa, Australia”, where “despite the fact that the markets of capital, labor, information destroys all state borders, they, at the same time, strengthen the tendencies of localization”, while “traditional institutions and practices of federalism, and above all, the principle of subsidiarity” are reproduced in a new way”<sup>15</sup>.

In connection with the presence of correlations between the trends towards globalization and regionalization, on the one hand, and the development of new characteristics of the theory and practice of federalism and unitarism as principles and forms of government, on the other hand, let us first turn to the analysis of the above processes of international integration. In our opinion, the formation of the scientific theory of regional studies is associated, first of all, with the streamlining (unification) of the conceptual apparatus, which is possible, in particular, on

<sup>10</sup> Plotnikova O, Dubrovina O. Globalization and regionalization, their influence on the international cooperation of states. P.135

<sup>11</sup> Romaičin I.A. On the nature of federalism// News of higher educational institutions. Volga region. 2018. № 1 (45), P.42-46. P.42

<sup>12</sup> Abdulaeva S.S. Comparative analysis of federalism in the USA and Germany. Dissertation research. // Law and order

<sup>13</sup> Makeeva N.V. Gulyakov A.D. Spec. works. P. 20

<sup>14</sup> Makeeva N.V. Gulyakov A.D. Spec. works. P. 20

<sup>15</sup> Bolshakov A.G. The fate of federalist projects in the post-Soviet space.// *Politiya*. 2007. №1 (44) P.112-125, P.114

the basis of systematization and research of doctrinally formulated, including in Russian science and officially defined (established in the sources of international and domestic Russian law) definitions. This applies, first of all, to the identification of criteria for assigning territories to such a category as “region”; to the establishment of a generally accepted idea of the concept of “regionalization”, its relationship with the concepts of “globalization” and “federalization”; to the study and systematization of possible typologies of regions. It is also important to achieve a more complete certainty regarding the correlation of concepts: “region”, “administrative-territorial unit”, “subject of the federation”, etc.

Regarding the definition of the concepts of “region” and “regionalism”, their characteristics in the Russian scientific literature are given through a comparative analysis with the concept of “globalization”, on this basis various opinions and assessments are expressed. As A.A. Kovalev (RANEPa, St. Petersburg): “Despite their external unidirectionality, mutual influence and interdependence, globalism and regionalism act, on the one hand, as synergistic complementary, catalyzing factors, and on the other, as complete antagonists. Any regional association is inherently a “mini-globalism”. However, it is regionalism that acts as an opponent and a tool to counteract globalism, thereby declaring itself as an absolutely independent and self-sufficient phenomenon that has its own structures, mechanisms, goals, logic and tools for the realization of its goals<sup>16</sup>. According to this author: “Despite the common nature of internalization, globalism and regionalism have quite fundamental differences. The basis of the globalization process is the unification of absolutely all systems of existence of society - from technological, economic and geopolitical world economic activity to an attempt to control the spiritual and value spheres, which immediately creates a threat to national and state security. For its part, the concept of regionalism finds its expression in such aspects as self-determination, self-identification, national, cultural, geographical and economic identification and proximity. In other words, globalization cannot be defined as a synergy of regional associations”<sup>17</sup>. Therefore, A.A. Kovalev believes that “the project of general globalization is artificially created and artificially supported, and the concept of regionalization is an absolutely natural phenomenon in any sphere of the life support of society - both modern and at any stage of the past or future”<sup>18</sup>.

Authors O Plotnikova and O. Dubrovina also draw attention to the fact that: “The process of regionalization can be considered as a tool for preserving regional identity in the context of globalization”, which is characterized “in such categories as social cohesion of ethnic, racial and linguistic groups living together;

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16 A.A. Kovalev / National Interests: Priorities and Security, 2017, V. 13, Iss. 6, P. 1150–1161

17 Kovalev A.A. Spec. works. P. 1153

18 Kovalev A.A. Spec. works. P. 1153

economic complementarity of those economic and industrial units that operate within a given territory; compatibility of common values associated with culture, religion, historical traditions”<sup>19</sup>. At the same time, both of these processes are assessed positively by the named researchers, indicating that “some regions, due to their border position, having a well-developed infrastructure, become points of contact between states” ... turn into centers of attraction for foreign partners, export-import commodity flows with their subsequent penetration deep into the territory of the state”<sup>20</sup>. In a number of publications by Russian authors, the concepts of “globalization through the regions of the state” and “globalization through the states” are distinguished<sup>21</sup>. Finally, the correlation between the processes of globalization and regionalization can also be determined by the criterion of the circle of subjects participating in the corresponding international relations. As Russian researchers note: “Globalization has a great impact on changes in the composition of international actors, their goals, means, interests and strategies. It brings to the international stage not only states and international organizations, but also the regions of the state, which are forced to act at the global level”<sup>22</sup>.

To the above, we add that globalization is associated with the emergence of two categories of international organizations to the level of global international relations - those that are subjects of public international law (the WTO, established in 1995, “which has become a symbol of the globalization of the international legal space”, the IMF and IBRD) and that are subjects of private international law (transnational economic corporations). Analyzing the activities of relevant international organizations, the Russian scientist V.B. Ryzhov (Moscow Pedagogical University) notes that a factor in the active interaction between the WTO and the OECD was “a phenomenal increase in the number of bilateral international investment treaties (IIT), the main purpose of which is to encourage foreign investment in developing countries. The protection afforded to foreign investors through these types of international treaties has led to the limitation of the host state’s ability to protect its interests.

These changes, in turn, have led to an increase in both foreign direct investment and portfolio investment across national borders. Similarly, the number of transnational corporations (TNCs or, as they are also called in the specialized literature, multinational enterprises) have increased significantly, along with the scale of their activities. In this context, the topical issue of international legal regulation

<sup>19</sup> Plotnikova O, Dubrovina O. Globalization and regionalization, their influence on the international cooperation of states. P.135

<sup>20</sup> Plotnikova O, Dubrovina O. Decree article. P. 136

<sup>21</sup> Khizhnyak V.S. International legal politics in the context of globalization and regionalization // Legal policy and legal life. 2020 №1, P 14-21; Plotnikova O, Dubrovina O. Decree article. P. 136

<sup>22</sup> Plotnikova O, Dubrovina O. Spec. works. P. 134

of the activities of TNCs is taxation and the efforts of states to prevent the erosion of the tax base and the transfer of profits”<sup>23</sup>.

In addition to the above aspects, the correlation of the processes of globalization and international regionalization is characterized by the fact that they are associated with different states and scales of regional international legal regulation. In this regard, the thesis put forward by the Russian author V.B. Ryzhov that: “Globalization and the development of law are interdependent processes that ultimately lead to the liberalization of various markets”<sup>24</sup>. Researchers, on this occasion, express the opinion that the processes of international regionalization cause risks of “fragmentation” of international law, while globalization stabilizes the international legal order. In connection with the development of international integration processes, in scientific studies of international legal regulation, doctrines of international legal constitutionalization of the international regional legal order, and even the general planetary legal order, are put forward. According to the study by V.B. Ryzhov: “Several influential areas of scientific thought suggest that the promotion of the idea of international legal constitutionalization is a product of globalization and accompanies the process of increasing the scope and number of international legal norms. A number of scholars analyze the causes and consequences of constitutionalization in the context of WTO law, thereby paying special attention to the role of globalization from the standpoint of constitutional economics”<sup>25</sup>.

The authors-carriers of the ideas of global constitutionalism (constitutionalization of general international law), as K.L. Chaika, proceed from “the notion that international law has reached a level of autonomy comparable to state sovereignty and has the same constitutional characteristics as national legal systems. At the same time, international law reflects the common interests of mankind, in contrast to national law, which translates the interests of individual states”<sup>26</sup>. Studies of the processes of globalization and international regionalization are thus connected with questions about the prospects not only of state law, but also of the nation state as a form of social and political organization, with questions about the modifications of the Westphalian system, about changes in the role of the state and one of its main attributes - sovereignty, about the form of the political and territorial structure of the state.

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<sup>23</sup> Ryzhov V.B. Dialectics of globalization and regionalization in the legal space of states and international organizations // International law and international organizations. – 2020. – № 1, P. 29-42. P.36

<sup>24</sup> Ryzhov V.B. Dialectics of globalization and regionalization in the legal space of states and international organizations // International law and international organizations. – 2020. – № 1, P. 29-42.

<sup>25</sup> Ryzhov V.B. Spec. article. P.30-31

<sup>26</sup> See about this: Chaika K. L. Global constitutionalism or constitutionalization of the right of integration associations? // State and Law, 2020, № 3, P. 142–151; State and law, 2020, № 3, P. 142–151

In connection with the study of complex states (including those arising on the basis of international integration processes), questions arise: is the “institutional completeness”<sup>27</sup> of integration processes, the transition from a quasi-federal union to a full federation, inevitable? As the well-known Russian researcher A.N. Medushevsky: “The key object of discussion concerning these integration projects (*related to the integration of regional state formations, in particular, the future European Union* – italics O.Zh.I.) is the fate of the principle of state sovereignty, which since the creation of the Westphalian system has remained the unshakable foundation of both international and constitutional law. At the same time, such questions are considered as: does it lose its role in the conditions of post-national constitutionalism, does it allow a new understanding (in the form of a “divided” sovereignty of the EU member states), or is it a transitional form from a nation state to the sovereignty of new transnational quasi-federal state associations with a special type of post-national justice”<sup>28</sup>. The answer to this question is given by practice: as is known, the draft European Constitution, designed to give the European Union a new functioning mechanism, was rejected at the 2005 referendum. The UK left the European Union on January 31, 2020 following a consultative referendum on June 23, 2016, in which 51.9% of those who voted supported the UK leaving the EU.

In the latest publications of foreign authors and a number of Russian researchers, there has been a discussion of the question: what is federalism since the 90s of the XX century, there are discussions between supporters of classical and new (based on factors of modern processes of international globalization and regionalization) ideas about the concepts of “federal form of state devices.” It is conditionally possible to distinguish two emerging approaches to the concept of “federal state structure”: international legal and state legal approaches. In accordance with the international legal approach: the traditional method of studying complex states, based on a comparative analysis along the line: federation-confederation-unitary state in modern realities is outdated, “does not work”. In particular, “the basic concept of the integration project of Europe, laid down by its creators 70 years ago – communitarianism”, which implies “consistent delegation of the sovereign powers of member states to supranational (non-state) institutions” “remains extremely uncertain, allowing completely different interpretations from the positions of cosmopolitanism, confederalism and federalism”<sup>29</sup>.

In our opinion, the essence of the “new direction” in understanding federalism is productive in connection with its perception as a “diverse and complex phe-

<sup>27</sup> See about this: Izotov D.A. International economic integration in the context of globalization and regionalization// Russian Foreign Economic Bulletin. 2021, №5 P.7-20 (P.10)

<sup>28</sup> Medushevsky A.N. Spec. article. P.8

<sup>29</sup> Medushevsky A.N. “Complex states”: the legal construction of B.N. Chicherin and modern political practice.// Russian justice. 2021. №12. P.8 (P.7-12)

nomenon". A.G. Bolshakov writes: "Modern federalism is a diverse phenomenon that includes a set of federal states, confederations, unions, unions, associated statehood, political and cultural autonomies, federalist institutions and practices in unitary states, supranational formations, etc."<sup>30</sup>. It must be borne in mind that the phenomena of "federation" and "federalism" are far from identical" concepts<sup>31</sup>. Far from all complex interstate unions are federations; far from all "federalist institutions and practices" represent a single state. Recognizing that: "the processes of international regionalization" give "a new impetus to the development of federalism" for the practices of decentralization of state power, and the importance of federalism as a possible state-forming factor, at the same time it is very important to preserve the established conceptual apparatus and key principles formulated in universal legal acts and in the constitutions of nation-states, which are known to establish the principles of the basic public order. Among the most important features of a federation as a single state, as a general rule, are, first of all, those that, unlike confederations and other association associations: this is not a narrow-profile union (for example, only economic, or only defense, or only an alliance intended for joint implementation diplomatic function, foreign relations) is an association in which all the most important internal and external state functions are carried out at the federal level. An important feature of a federation is that sovereignty belongs to the federal level of power. On this occasion, it is appropriate to quote the Chairman of the Constitutional Court of the Russian Federation V.D. Zorkin, who writes in his publication: "Despite the deep and numerous changes that have taken place in the world over the past decade and a half, state sovereignty remains the basis of the constitutional order of most states. Unlike the situation that developed after the conclusion of the Peace of Westphalia in 1648, today the scope of the sovereignty of democratic constitutional states is significantly limited by internal and external factors, as well as legal norms. However, the provisions enshrined in the Westphalian peace treaties remain unshakable"<sup>32</sup>.

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<sup>30</sup> Bolshakov A.G. Decree. Article P.112

<sup>31</sup> Bolshakov A.G. Decree. article P.112

<sup>32</sup> Valery Zorkin: Apologia for the Westphalian system August 22, 2006

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表现出作为俄罗斯联邦公民主要价值观之一的心态特征  
**MANIFESTATION OF MENTALITY FEATURES AS ONE OF THE  
MAIN VALUES OF THE RUSSIAN FEDERATION CITIZENS**

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注解。现代信息和宣传过程的主导地位是军事新闻。苏联的军事新闻，宣传的细节，军事记者。一群特殊的作家——军事记者。2022年特种作战二战兵团文本的前线消息来源、体裁、主题定位。

关键词：特种作战，去纳粹化，谣言，神话，仪式，赝品。

**Annotation.** *The dominant of the modern information and propaganda process is military journalism. Military journalism in the SOVIET UNION, the specifics of propaganda, military correspondents. A special group of writers - military correspondents. Sources of front-line news, genres, thematic orientation of the texts of the Second World War Military Corps of the special operation in 2022.*

**Key words:** *special operation, denazification, rumors, myths, rituals, fakes.*

Patriotism is considered a universal all-human category, understood as a national spirit. Factors in the development of a sense of patriotism determine cultural and life experience, which is formed on the principles of community, unity and interweaving of spiritual values. At present, a powerful upswing of patriotic values is felt in the territory of the Russian Federation in connection with the ongoing political events. The dominant of the modern information and propaganda process is military journalism. This is a special energy of the texts, which are subject to one point of view - the protection of the propaganda force, the Russian and Soviet state.

How did military journalism begin in the Soviet Union? On the eve of the Second World War, information channels did not pursue the goal of waging agitation-propaganda wars in extreme specifications. But nevertheless, such events took place, for example, during the years of the Soviet-Finnish war of 1939–1940, although there were isolated cases of the dissemination of implausible informa-

tion, in order to confuse the enemy, they were already used then, although they were not massive. On June 24, 1941, the Central Committee of the All-Union Communist Party of Bolsheviks and the Council of People's Commissars of the Soviet Union adopted a joint resolution "On the Creation and Tasks of the Soviet Information Bureau." defines the main tasks"[1].

In difficult times, the true features of the patriotism of the masses are manifested, some are ready to give their last for victory, while others are in a hurry to cash in on the misfortune and suffering of the people. Over the past two decades, the socio-economic condition of our country has been changing at an extremely rapid pace. The consciousness of the majority of Russians was unable to adequately perceive these drastic changes. The spiritual principles on which most of them grew up were not conducive to adaptation to the new conditions. This led to the fact that the concept of the Motherland either devalued or lost its essential content. Naturally, no society is able to exist in such a state for a long time. A situation has arisen when huge efforts are required to find a real understanding of the Motherland phenomenon, and hence, to fill the concept of patriotism with content that is relevant to modern times.

The component of patriotism is formed as a system of values that a person comprehends from the point of view of his national identity, specific features, and mentality. The study of the distinctive features of the Russian nation from the positions of socio-philosophical, spiritual-moral, psychological-pedagogical will help to answer the questions: what is Russian patriotism.

Features of the Russian mentality, its mental bonds have certain features. This is an uneven manifestation of feelings, the desire for spiritual values, the endless search for goodness, truth, justice, the special conscience of Russians, love for freedom, above all, freedom of the spirit. It is difficult to limit the Russian character to some formal rules, to force him to follow certain laws. Collectivism gives rise to readiness for self-sacrifice, catholicity. National fortitude, i.e. patience and perseverance in enduring life's hardships and hardships. Tolerance, the ability to understand representatives of other peoples, to interact with them, to sacrifice the latter in the name of humanity.

The study of the distinctive features of the Russian nation from the positions of socio-philosophical, spiritual-moral, psychological-pedagogical will allow us to identify the theoretical foundations of patriotism in an extreme situation, to identify trends in the modern socio-cultural reality of the Russian Federation. In the functional-objective development of the media, the understanding of the motives of the struggle was of decisive importance. Military journalism, showing the heroic, cleansed a person, introduced him to empathy, while knowing the measure and the limit. An extreme situation can also be considered as a point where time breaks up, a heroic sacrifice brings time points closer, since an event, a feat takes place for



the sake of the future. Momentary sacrifice is glorification, sacrifice stretched over the life of a generation is glorified already on a verbal plane, more ideologically than in reality. Mythical reality interpretation rated events an order of magnitude higher than reality, the creators of the texts allowed a significant proportion of fiction, associations, symbols. Such enlarged archetypes can be justified and accepted only in conditions of an extreme period.[2]

The nature of the press can be represented as a special mental structure, the nature of which was due to an extreme situation. Historical events are, as it were, framed by myths; this historical and mythical image influenced the consciousness of people. The media-centered paradigm focused on the problem of information impact on readers and the formation of mythical consciousness. The anthropocentric paradigm was oriented towards extreme myth-making, the preferences of the audience, and the needs of wartime.

The print press of the extreme period, as a type of ideological influence, supplemented all types of influence in terms of form, content and functions and was defined as a means of instilling patriotic beliefs, influenced changes in the traditional information space. But the text can become an instrument of political action only when it acquires a public sound. Such publicity was achieved through its mass implementation through the media. During the Great Patriotic War, the “maternal principle” was materialized with the highest propaganda success in the poster “The Motherland Calls!”, Placed on the pages of all central newspapers. Mass media channels, printed publications of the war period distributed could be, as well as a story about military operations, and about the work of the home front with their successes for the good of the front, or about the humanism of a liberator soldier, the restoration of peaceful life in the liberated territories, etc. Wartime conditions demanded efficiency and speed from the press in presenting this or that material. The news press is coming to the forefront: it was necessary to briefly, quickly, concisely talk about the experience of conducting combat, mastering military equipment and military tactics. Ideally, the reporting corresponded to the requirements of the situation (the author’s “I”, dynamics, visibility in the image of the event). It becomes the main tool of war correspondents, Krasnoarmeyskaya Pravda, Suvorov Onslaught, Frontline Pravda, For the Honor of the Motherland and other newspapers regularly published reports. Fiction in the system of artistic and journalistic genres in the mid-30s was successfully implemented in the information genres of the war period. The report approached the essay, invading the sphere of reflection of the inner world of a person. The essay, in turn, approached the short story. But the report did not focus on the character of the hero, the event remained its main object. The report included elements of diatribe, socolloquium, details of behavior, interviews with participants in the events, etc.

The most tragic publications were lined up in such a way that they forced each individual to be involved in what was happening, to empathize with the misfortune. They called readers through tragedy, pain and loss - to spiritual purification, to a high emotional outburst, to sensuality. It was this that deepened morality, strengthened national self-consciousness and patriotism. Sacrifice, heroism, patriotism were supplemented by images of mother nature, it was from there that the most powerful energy came. The Greeks represented the seasons in the form of women: spring was depicted as a woman in a wreath of flowers, standing next to a flowering shrub; summer - by a woman with a wreath of ears of wheat, holding a sheaf in one hand, and a sickle in the other; autumn - bearing bunches of grapes and a basket full of fruits; winter - bareheaded near trees with fallen leaves

“Each nation,” writes I. Ilyin, “is called upon to accept its natural and historical “givenness” and work it out spiritually, overcome it, spiritualize it in its own way, being in its own unique national creative act. It is his inalienable, natural, sacred right.” [3]

In order to survive, the state, as Ilyin advised, must accept its natural and historical “givenness” and begin to truly act in the interests of society. Which means the development of a nationwide modernization project that is beneficial to all its main layers, except for the oligarchs who do not invest their capital in the country. And then “as in science” - the basic mechanism of functioning and development is innovative activity in all areas of practice. Taking into account the fact that it was she who throughout history was “in the grip” of the contradictions of national culture [4].

Patriotism is the desire for the common goals and interests of the state, which are priority over any others, whether it be the interests of an individual, a group of people or society as a whole. It is patriotism that purifies that influences the development of a sense of nobility, conscience, courage and self-sacrifice. If this is required by the interests of the homeland of Russia in confrontation with the West, one military victory will not be enough, a new internal social state of Russian society will be required. At present, “Russian patriotism is unstable, amorphous, indefinite nature, corresponding to social realities ”After achieving victory on the battlefield, it will be necessary to convert it into reformatting the country and the political system, as well as getting rid of the legacy of the 90s and the comprador elite. Victory in the special operation will be a turning point in the formation of a new world order. This is a mental war, and there can be only one winner, there can be no draw by definition, only the unconditional Victory of the Special Operation stimulated the split of Russian society. A significant part of the ruling class and officials, who entered Russia into the structures of the West as a raw materials appendage, while receiving considerable benefits and taking rent from their position, far from welcomed the start of the special operation and did not intend to change

anything in the country. Many of those in power today are ready for such an act, they build their well-being on other principles of life, the interests of the state and society are empty space for them. At the other extreme is the Russian people, for whom the honor of the country and the dignity of the Russian person is valued and allows us to assert that Russia has its own way of development.

If we follow the call of Ilyin - to see and denounce the vices of the nation - then self-interest can be understood as both the egoism of achieving power and the "self-preservation instinct", closely related to its attributes, and not to hard work on the effectiveness of power. This is addressed to the elite, its choice of politics "like war" (K. Schmitt), business or management. In turn, almost all of her theories are based on the fact that ordinary people are overwhelmingly incompetent in the use of their freedom. And in order to realize the intellectual potential of citizens, "smart" leadership, the state, is needed. Then M.I. is right. Borovkov (and many before him), who believe that "the problem lies in the quality of the ruling elite of modern Russia, its ability and desire to be patriotic and act, first of all, in the interests of the Fatherland and its citizens." [5]

Patriotism can be considered in three aspects: in the ontological - as really existing feelings, views, ideas; epistemological - as a reflection of social reality in the mind of a person; value and praxeological - as a person's attitude to the world through the significance of spiritual and material landmarks, as a spiritually transforming attitude to reality.

The ontological aspect of the knowledge of patriotism concerns its existence, tendencies of functioning and development. At the same time, the ontological aspect affects a person with his social qualities, since a person as a subject of social life is included in the system of social relations. This is the objective basis for the diversity of points of view on the question of the essence of patriotism. It is quite obvious that different historical situations, the nature of trends in social development, and the worldview positions of a person determine different approaches to understanding the essence of patriotism. It can be argued that this essence itself is evolving, filled with different content. The epistemological aspect of the concept of "patriotism" is associated with the reflection of reality on two levels: emotional and rational. This also includes the solution of such problems as: how is the knowledge of patriotism carried out, what is the role of social practice, various kinds of sociocultural research in its knowledge. With the epistemological aspect of the knowledge of patriotism, the problems of the so-called "common sense" and mythological thinking are not without meaning. The epistemological aspect of understanding patriotism reflects its structure in terms of reflecting social life. The structure of patriotism in the theoretical and epistemological aspect can be represented as a phenomenon that manifests itself at two levels: everyday and scientific and theoretical. Both in socio-historical terms and from the point of view

of epistemology, patriotism is undoubtedly present in the ordinary everyday consciousness of a person. The example of patriotism clearly shows that the psychology of patriotism precedes its ideology. The ideology of patriotism did not yet exist, when the patriotic feeling had already existed for many centuries. The ideology of patriotism takes shape only in the bourgeois era, remaining until that time the main element of social psychology.

The axiological and praxeological aspects in the understanding of patriotism reflect the connection of consciousness with the practical activity of a person. These aspects of patriotism provide one of the most striking examples of the active role of consciousness in relation to being, because they serve as a stimulus for human actions, both in everyday activities and in defending the fatherland. The effective side of patriotism is decisive, because it is the result of the “work” of the emotional and rational levels, it transforms ideas into material force. Therefore, it is this aspect of the analysis that will form the basis of this study. Ontological, epistemological, praxeological and axiological aspects in the process of cognition of patriotism are closely connected with wallpaper, forming an integral structure of cognitive activity.

The sociocultural approach, which is the main one in this study, operates with a certain model of society. Society is understood here as a socio-cultural system that arises and changes as a result of the actions and interactions of people, the nature of society is determined by the “type of anthroposocietal correspondence”, the type of compatibility of personal characteristics of members of society with the type of society itself

Modern journalism, new mass media channels and modern sources of information are becoming an integral part of any military operations, especially during an extreme period. And the main skill of a journalist is to objectively assess the events and phenomena that are taking place, to make an author’s opinion, but at the same time, impartial. Operational tools of information and psychological influence: disinformation, providing the enemy with data that misleads him about the true state of affairs at the front and in the rear.

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学龄前儿童严重合并颅脑损伤的平均动脉压昼夜节律  
**CIRCADIAN RHYTHM OF MEAN ARTERIAL PRESSURE IN  
SEVERE CONCOMITANT TRAUMATIC BRAIN INJURY IN  
PRESCHOOL CHILDREN**

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抽象的。入院当天,平均动脉压(MBP)昼夜节律中值水平在可接受的生理值范围内。根据 SCTBI 的严重程度,检测到第 2 组和第 3 组 MBP 昼夜节律中值分别增加 10 mmHg 和 9 mmHg。SCTBI 急性期中肌的变化呈波状,最接近于一周一次的节律;在第 1 组中,检测到 6 天的波动期。在组中显示了 2、10、4、5 个每日波。在第 3 组中,第一个 8 天的波被变形曲线取代,周期为 4-5 天,波动幅度不一。第 1 天在所有儿童中观察到最明显的循环系统应激反应,然后在第 2 组中由于应激保护治疗的减少而转移到科室之前,第 1 组再次出现动脉高血压倾向 - 第 2 天15、第3组-第20天因合并继发因素,加感染。

关键词: 昼夜节律, 平均动脉压, 严重合并颅脑损伤, 学龄前年龄。

**Abstract.** *On the day of admission, the level of the mesor of the circadian rhythm of the mean arterial pressure (MBP) was within acceptable physiological values. Depending on the severity of SCTBI, an increase in the mesor of the circadian rhythm of MBP in groups 2 and 3 by 10 mmHg and 9 mmHg, respectively, was detected. Changes in the mesor in the acute period of SCTBI were of a wave-like nature, closest to a circa-weekly rhythm; in group 1, a 6-day fluctuation period was detected. In group 2, 10, 4, 5 daily waves were indicated. In group 3, the first 8-day wave was replaced by deformed curves with periods of 4-5 day fluctuations of various amplitudes. The most pronounced stress reaction of the circulatory system was observed in all children on day 1, then the tendency to arterial hypertension was repeated in group 1 before transfer to the department due to a decrease in stress-protective therapy, in group 2 - on day 15, in group 3 - on day 20 due to with secondary factors, the addition of infection.*

**Keywords:** *circadian rhythm, mean arterial pressure, severe concomitant traumatic brain injury, preschool age.*

**Relevance.** Concomitant traumatic brain injury (CTBI) accounts for 43-68% in the structure of concomitant injuries and is observed in 23-63% of patients with severe traumatic brain injury (TBI). Extracranial risk factors for the development of an unfavorable outcome in patients with CTBI can be: injuries of the abdominal organs, age, the presence of episodes of hypoxia and arterial hypotension, the development of complications in the postoperative period. Postoperative mortality in patients with CTBI is 46.8% according to the authors. Mean arterial pressure (MBP) is the pressure in the bloodstream during the entire cardiac cycle, regardless of systole and diastole. This indicator displays the blood supply to the vital organs. MBP is considered normal when its value fluctuates between 80-95 mmHg [1-5]. Due to the lack of information on the characteristics of hemodynamics in severe concomitant traumatic brain injury in preschool children (3.1-7 years old) we tried to study the change in the structure of the phase characteristics in the acute period and assess the response of the circadian rhythm of the mean arterial pressure to severe concomitant traumatic brain injury.

**Purpose of the work.** To study and identify the features of the circadian rhythm of mean arterial pressure in children with severe concomitant traumatic brain injury in children of preschool age.

**Material and research methods.** The results of monitoring clinical and functional parameters, hemodynamics, including mean arterial pressure in 34 children aged 3.1-7 years with SCTBI were studied. Of these, 12 children were assigned to a less severe group with a duration of intensive care in the ICU up to 10 days, patients with a duration of therapy of 11-20 days were included in group 2, and 10 patients with a duration of intensive care for more than 21 days were included in group 3. In each group, male patients predominated, amounting to 9 in group 1, 2-8 in group 3, 8 boys in group 3 (table 1) aged on average 5.4-5.1 years. The cause of the injury was RTA in 9, 7, 10 children in groups, respectively, and a fall from a height in group 1, 3 children, in 2-5 children. All patients admitted to the RRCEM were operated on in the first hours after the injury, in extremely severe patients with simultaneous resuscitation and correction of serious violations of vital organs and systems (tab. 1).

**Table 1***Characteristics of SCTBI patients admitted at the age of 3.1-7 years*

Groups	Number of patients	Gender m/f	Age, years	RTA	Catatra-uma	Traum. shock 2,3 deg.	Oper. on the day of admission	Num. of days in ICU	Num. of days in hospital
1	12	9/3	5.4±1	9	3	12	12	5.4±1.4	16.2±5.2
2	12	8/4	5.25±1.2	7	5	12	12	15±2.8	24±5.9
3	10	8/2	5.1±0.9	10	0	10	10	39.9±15.8	46±18.6

**Table 2***Duration of respiratory support*

Groups	CMV	IPPV	SIMV	CPAP	Spont breath
1(12 pat)	2.2±1.4 (5)	-	3±1 days (2)	1 (1)	3.5±1.4 (12)
2 (12 pat)	6±3 (6)	2 (1)	7.6±2.8 (9)	3.2±1.5 hours (8)	5.4±2.7 (12)
3 (10 pat)	10.5±8.5 (6)	10.3±4.4(2)	14.7±8.6 (9)	6.6±2.8 (7)	15.8±8.9 (10)

As shown in tab. 2, almost all patients admitted to the clinic needed prosthetics for external respiration after a severe injury. Differences in the duration of ALV/AALV according to the severity of the condition were not identified. The determining factors in the severity of the condition of injured children in group 3 were severe CTBI (50%), severe OSTBI (50%), skull fracture with transition to the base (50%), SBC (100%), traumatic shock grades 2-3 (100%).

**Results and its discussion.** On the day of admission, the level of the mesor of the circadian rhythm of the MBP indicator was within acceptable physiological values, although an increase in groups 2 and 3 by 10 mmHg.9 mmHg was detected ( $p<0.05$ , respectively). In the dynamics of the acute period of SCTBI in group 1, on day 4, an increase in the MBP mesor index was observed on day 4 by 7 mmHg ( $p<0.05$ ). In group 2, MBP did not change significantly, while in children of group 3, an increase of 7 mmHg ( $p<0.05$ ) was found on day 10, which indicated a compensatory response to more severe brain damage that persisted at a later date, overall severity of the condition. A relatively significant tendency to increase the mesor of the circadian rhythm MBP relative to that in groups 1 and 2 remained throughout the entire observation period. Changes in the mesor in the acute period of SCTBI were of a wave-like nature, the closest to a weekly period was a 6-day fluctuation period in group 1. In group 2, 10,4,5 daily waves were indicated. In group 3, the first 8-day wave was replaced by deformed curves with periods of 4-5 daily fluctuations of various amplitudes (fig. 1).

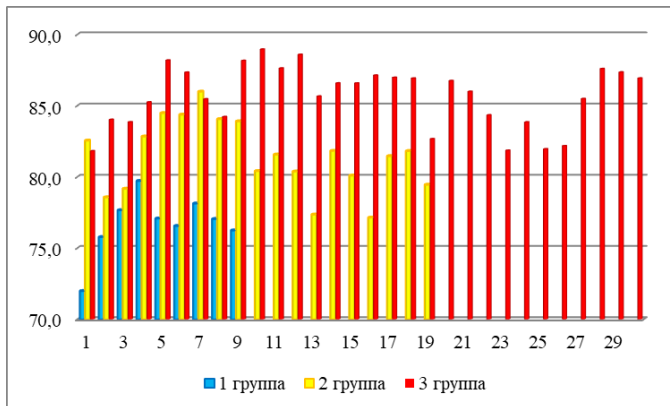


**Table 3.**  
*Mesor dynamics of the circadian rhythm of mean arterial pressure*

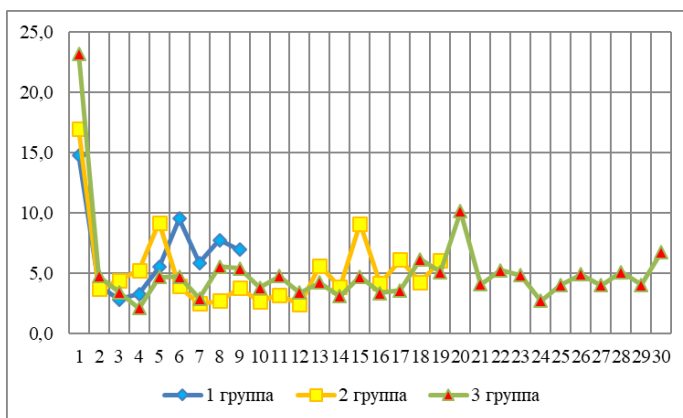
Days	Group 1	Group 2	Group 3
1	72.0±4.4	82.5±3.8 <sup>m</sup>	81.8±4.7 <sup>m</sup>
2	75.8±1.5	78.6±1.5	84.0±2.1
3	77.7±1.1	79.2±1.7	83.8±1.5
4	79.7±1.7*	82.8±1.9	85.2±1.1
5	77.1±1.3	84.5±3.1	88.2±1.8
6	76.6±3.1	84.4±1.5	87.3±1.9
7	78.1±3.1	86.0±1.0	85.5±1.4
8	77.0±4.3	84.1±1.2	84.2±3.0
9	76.2±2.6	83.9±1.5	88.2±2.4
10		80.4±1.6	89.0±1.3 <sup>m</sup>
11		81.6±1.2	87.6±2.1
12		80.4±1.1	88.6±1.9
13		77.3±2.0	85.7±1.6
14		81.8±1.7	86.6±1.3
15		80.1±2.2	86.6±1.7
16		77.1±1.9	87.1±1.6
17		81.5±2.1	87.0±1.5
18		81.8±1.8	86.9±2.3
19		79.4±2.3	82.7±2.1
20			86.7±2.6
21			86.0±1.9
22			84.3±2.3
23			81.9±2.4
24			83.8±1.3
25			82.0±1.2
26			82.2±2.2
27			85.5±2.3
28			87.6±2.5
29			87.3±2.0
30			86.9±2.5

\*- the difference is significant relative to the indicator on the first day.

<sup>m</sup>-the difference is significant relative to the indicator on the first day.



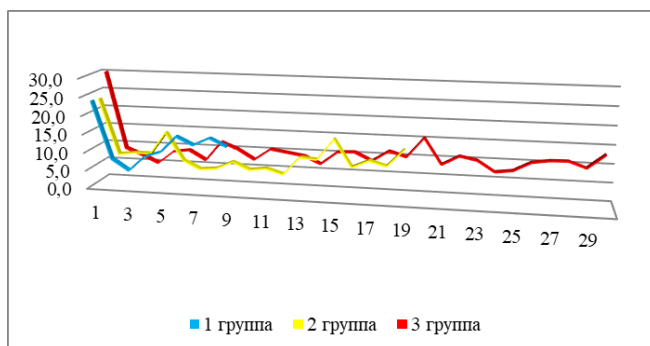
**Figure 1.** Mesor dynamics of the circadian rhythm of mean arterial pressure in SCTBI at the age of 3.1-7 years, mmHg



**Figure 2.** Amplitude of the circadian rhythm MBP at 3.1-7 years, mmHg

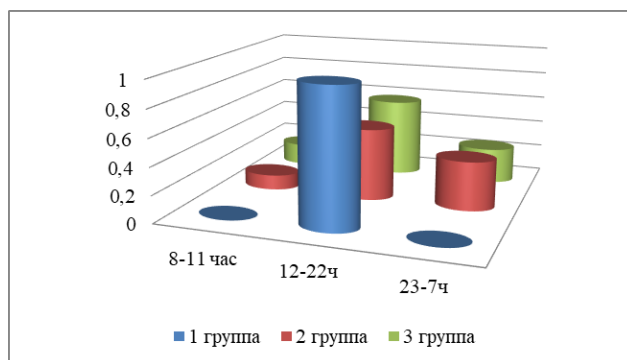
The greatest amplitude of diurnal fluctuations in MBP was observed on the first day, amounting to 15 mmHg in group 1, 17 mmHg in group 2, and 23 mmHg in group 3. Subsequently, changes in the amplitude of the MBP circadian rhythm occurred in waves in a near-weekly rhythm, amounting to the first wave 6 days long in all patients with batiphase in group 1 on day 3, group 2 on day 2, group 3 on day 4. Subsequently, the largest amplitude of the circadian rhythm was revealed in group 1 - 4 mmHg, in group 2 - 5 mmHg on day 15, in group 3 - 5 mmHg on day 20 (fig. 2). It is known that an increase in the amplitude of daily fluctuations occurs due to a more pronounced stress reaction of hemodynamics, it should be as-

sumed that the most pronounced stress reaction of the circulatory system was observed in all children on day 1, then further in group 1 on day 6, in group 2 - on day 15, 3 - on the 20th day. The repeated stress response of MBP can be explained in groups 2 and 3 by secondary complications, often due to the addition of infection.



**Figure 3.** Daily range of fluctuations in mean arterial pressure at the age of 3.1-7 years

In group 1, the increase in the amplitude of diurnal fluctuations on day 6 is most likely associated with a decrease in stress-protective therapy (hypnotics, sedatives, anticonvulsants) before transfer to a specialized department for further therapy. The daily range of fluctuations in the circadian rhythm MBP occurred quite synchronously with changes in the amplitude index of the circadian rhythm MBP (fig. 3).



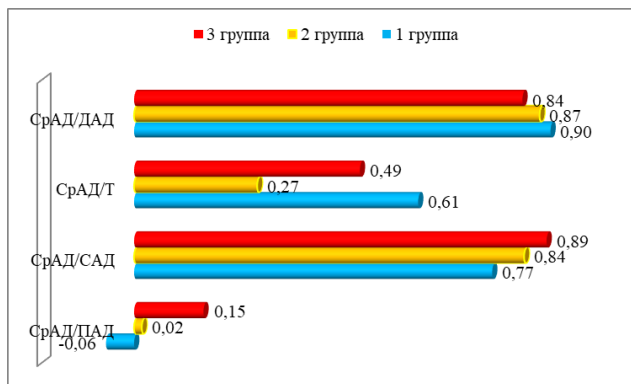
**Figure 4.** Duration of MBP acrophase shifts according to the severity of the condition

In all groups, the duration of a moderate shift in the peak of the acrophase of the circadian rhythm MBP prevailed, amounting to 100% in group 1 (fig. 4).

**Table 4.**  
*Correlations of mean BP*

	Group 1	Group 2	Group 3
MBP/PBP	-0.06	0.02	0.15
MBP/SBP	0.77	0.84	0.89
MBP/T	0.61	0.27	0.49
MBP/DBP	0.90	0.87	0.84

A strong direct correlation was found between MBP and SBP and DBP in all subjects (tab. 4). That is, a direct dependence of the MBP indicator on both the SBP level and the degree of peripheral vascular tone in all groups was revealed (fig. 5). A moderate direct dependence of the MBP index on changes in body temperature was observed only in 1 group of injured children. Perhaps, due to the severity of brain damage in groups 2 and 3, the compensatory mechanisms of the hemodynamic compensatory response to the systemic inflammatory response of the body of children with SCTBI were lost.



**Figure 5.** *Correlations of mean BP.*

**Conclusion.** On the day of admission, the level of the mesor of the circadian rhythm of the MBP indicator was within acceptable physiological values, depending on the severity of SCTBI, an increase in the mesor of the circadian rhythm of MBP in groups 2 and 3 by 10 mmHg, 9 mmHg, respectively. Changes in the mesor in the acute period of SCTBI were of a wave-like nature, the closest to a weekly

rhythm was a 6-day fluctuation period in group 1. In the 2nd group 10,4,5 daily waves were designated. In group 3, the first 8-day wave was replaced by deformed curves with periods of 4-5 day fluctuations of various amplitudes. The most pronounced stress reaction of the circulatory system was observed in all children on day 1, then further in group 1 before transfer to the department due to a decrease in stress-protective therapy, in group 2 - on day 15, in group 3 - on day 20 due to secondary factors, attachment of infection.

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<https://www.stud24.ru/medicine/cherepnomozgovaya-travma-u-detej/>

在占主导地位的院士A.A.乌赫托姆斯基的影响下,经受过COVID-19,患有冠心病的成年第二期妇女的肺部生命力的时间生物学指标。

**CHRONOBIOLOGICAL INDICATORS OF THE VITAL CAPACITY OF THE LUNGS OF WOMEN OF THE SECOND PERIOD OF ADULTHOOD WHO HAVE ENDURED COVID-19, SUFFERING FROM CORONARY HEART DISEASE, UNDER THE INFLUENCE OF THE DOMINANT ACADEMICIAN A.A. UKHTOMSKY**

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**摘要** 文章首次介绍了居住在西伯利亚南部的46名第二成熟年龄 ( $47.6 \pm 1.8$ 岁) 的妇女在8、12、16和20小时内肺活量 (VCL, cm<sup>3</sup>) 的时间生物学研究结果,她们是Covid-19大流行的幸存者,在A.A. Ukhtomsky主导的影响下患有冠心病 (CHD)。第一次将人类本体发育的第9阶段 (持续20年) 有条件地划分为相等的5年生命间隔: 从36到40岁,从41到45岁,从46到50岁,从51到55岁。VCL是用日本制造的CHEST HI-801型肺活量计评估的。结果显示,白天和一周的VCL,特别是在12和16小时,使用Ukhtomsky主导的VCL明显增加,尽管有Covid-19大流行和存在CHD形式的躯体疾病。随着护照年龄在本体发育的一个年龄段内增加,呼吸系统的功能能力下降。

**关键词:** 妇女,成年的第二个时期,缺血性心脏病, Covid-19, 肺活量, 时间生物学。

**Abstract.** The article presents for the first time the results of a chronobiological study at 8, 12, 16 and 20 hours during the week of vital capacity of the lungs (VCL, cm<sup>3</sup>) in 46 women of the second mature age ( $47.6 \pm 1.8$  years) living in the south of Western Siberia, survivors of the Covid-19 pandemic, suffering from coronary heart disease (CHD) under the influence of the dominant A.A. Ukhtomsky. For the first time, the 9th stage of human ontogenesis, which lasts 20 years, is conditionally divided into equal 5-year intervals of life: from 36 to 40 years, from 41 to 45 years,

*from 46 to 50 years and from 51 to 55 years. The VCL was assessed with a CHEST model HI-801 spirometer made in Japan. It was shown that VCL during the day and week, especially at 12 and 16 hours, with the use of the Ukhtomsky dominant significantly increases, even despite the Covid-19 pandemic and the presence of a somatic disease in the form of CHD. As the passport age increases within one age period of ontogenesis, the functional capabilities of the respiratory system decrease.*

**Keywords:** *women, second period of adulthood, ischemic heart disease, Covid-19, lung capacity, chronobiology.*

**Relevance.** Issues related to the Covid-19 coronavirus pandemic have not left the pages of special journals in recent years [17, 18, 19, 20].

The Covid-19 coronavirus pandemic has made significant changes in the habitual lifestyle of every person on earth, including a huge number of patients with diseases of the cardiovascular system (CVS) [1, 8]. The SARS-CoV-2 pathogen that causes Covid-19 is an infection that affects the cardiorespiratory system [4, 7, 9, 13, 15], causing serious complications such as exacerbations of CHD, myocardial infarction, cardiac arrhythmias, thrombosis [6, 16]. Thus, in particular, CVS complications occur in 20-25% and cause death in 40% of patients [3, 11, 12, 14].

Long-term self-isolation due to Covid-19 in conditions of limited living space, a significant restriction of motor activity significantly affected the functional state of CVS. The infection chose the heart as one of the targets, the functional significance of which in the overall structure of human life can hardly be overestimated [2, 5, 10].

In the available literature, we did not find studies characterizing the effect of a long-term regime of self-isolation in women of the second period of adulthood suffering from CHD without signs of chronic heart failure on the chronobiological parameters of VCL, firstly, under the influence of a simultaneous positive verbal suggestion to create a dominant of academician A.A. Ukhtomsky and, secondly, against the background of a pleasant musical accompaniment.

**Purpose:** in women of the second period of adulthood who have experienced the Covid-19 pandemic, to study VCL chronobiologically under the influence of positive verbal influence to create a dominant of academician A.A. Ukhtomsky in terms of using musical accompaniment.

**Material and methods.** We examined 46 women of the second period of adulthood ( $47.6 \pm 1.8$  years) living in the south of Western Siberia, who had experienced the Covid-19 pandemic and were being treated at the FSBEI WSMC FMBA Russia Tyumen for chronic CHD without signs of heart failure. In the available literature, we did not find reports dividing the 9th stage of human ontogenesis in time, i.e., the period of the second mature age, lasting 20 years, and therefore we

conditionally divided it into equal 5-year life spans: from 36 to 40 years ( $38.4 \pm 1.4$ ;  $n=12$ ), from 41 to 45 ( $43.1 \pm 1.24$ ;  $n=11$ ) years, from 46 to 50 ( $48.2 \pm 1.3$ ;  $n=10$ ) years and from 51 to the age of 55 ( $52.7 \pm 1.6$ ;  $n = 13$ ) years. Such a division, firstly, seems to us important from a functional point of view and, secondly, from the standpoint of the tactics of developing a restorative treatment for CHD.

From the anamnesis it was established that the duration of CHD disease was  $6.2 \pm 1.4$  years.

All women underwent a comprehensive assessment of the functional state of the respiratory and CVS in a state of physiological rest and after dosed physical activity. In this post, we only share the results of studying VCL at rest with the creation of a dominant of A.A. Ukhtomsky through a positive 10-minute verbal hypnotic suggestion against a background of pleasant musical accompaniment. VCL was measured with a CHEST model HI-801 spirometer made in Japan.

When applying a dominant of academician A.A. Ukhtomsky, we proceeded from the fact that the human brain during wakefulness works on certain algorithms that require constant updating. We assumed that the process of updating neural connections in the brain would be better if it was stimulated by breathing to musical accompaniment and verbal hypnotic suggestion to create a dominant according to A.A. Ukhtomsky. An unresolved issue in this situation is to identify the individual characteristics of the physiological adaptation of women aged 36 to 55 who have had Covid-19 against the background of existing CHD, by studying the functional capabilities of the respiratory system by assessing VCL from the position of a dominant of academician A.A. Ukhtomsky.

To this end, under a pleasant musical accompaniment chosen by a woman (most often “Rondo Alla Turca” - “Turkish Rondo”) V.A. Mozart for 10 minutes calmly convinced her that she would be able to increase her VCL without much effort and without visible tension, i.e., effortlessly.

We made the assumption that even if short in time, but it is precisely the positive nature of suggestion against the background of musical accompaniment, it can be that irritant for the brain, which, in accordance with the teachings of academician A.A. Ukhtomsky about the dominant, programs it for a more pronounced and time-stable preservation of the function of the respiratory system.

The results of the study were processed on a personal computer using modern electronic programs (STATISTIKA). The assessment of the significance of differences was carried out using Student's *t* test.

The principles of voluntariness, the rights and freedoms of the individual, guaranteed by Articles 21 and 22 of the Constitution of the Russian Federation, as well as the Order of the Ministry of Health and Social Development of Russia № 774n dated August 31, 2010 “On the Council on Ethics” are observed. The study was conducted in compliance with the ethical standards set forth in the Declara-



tion of Helsinki and the Directives of the European Community (8/609EC) and the informed oral consent of women.

### Results and discussion.

By observing the protective regime in the therapeutic department, we tried to protect women with CHD as much as possible from external negative influences and tried to make the stay in the ward not only as comfortable as possible, but also useful in terms of self-education. In this regard, when studying the resistance of women to hypoxia, we, firstly, explained to them not only the methodology and progress of each study, but also their practical importance for women. Secondly, they taught how to use the CHEST model HI-801 spirometer. Thirdly, they pointed to the normative values of the studied indicators.

The chronobiological determination of VCL in women indicated that it significantly ( $p < 0.05$ ) changes during the day and week (tab. 1) due to the use of positive verbal suggestion against the background of music (mainly W.A. Mozart).

**Table 1.**

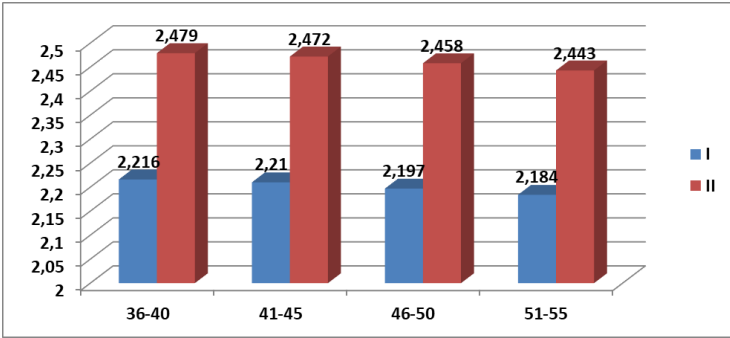
*Chronobiological indicators of lung capacity in women aged 36 to 55 years on Monday in a state of physiological rest (I) and after combined (II) positive suggestion and music ( $M \pm m$ )*

Time	Age			
	36-40	41-45	46-50	51-55
8 hours	I. 2,227 $\pm$ 0,109 II. 2,493 $\pm$ 0,112 Increase 0,266	I. 2,221 $\pm$ 0,111 II. 2,484 $\pm$ 0,115 Increase 0,263	I. 2,209 $\pm$ 0,108 II. 2,471 $\pm$ 0,116 Increase 0,262	I. 2,198 $\pm$ 0,102 II. 2,459 $\pm$ 0,115 Increase 0,261
12 hours	I. 2,233 $\pm$ 0,110 II. 2,499 $\pm$ 0,111 Increase 0,266	I. 2,228 $\pm$ 0,112 II. 2,493 $\pm$ 0,110 Increase 0,265	I. 2,221 $\pm$ 0,109 II. 2,485 $\pm$ 0,115 Increase 0,264	I. 2,193 $\pm$ 0,103 II. 2,461 $\pm$ 0,113 Increase 0,263
16 hours	I. 2,240 $\pm$ 0,112 II. 2,508 $\pm$ 0,118 Increase 0,268	I. 2,237 $\pm$ 0,115 II. 2,504 $\pm$ 0,120 Increase 0,267	I. 2,226 $\pm$ 0,109 II. 2,488 $\pm$ 0,115 Increase 0,262	I. 2,191 $\pm$ 0,103 II. 2,452 $\pm$ 0,114 Increase 0,261
20 hours	I. 2,216 $\pm$ 0,112 II. 2,479 $\pm$ 0,116 Increase 0,263	I. 2,210 $\pm$ 0,112 II. 2,472 $\pm$ 0,118 Increase 0,262	I. 2,197 $\pm$ 0,108 II. 2,458 $\pm$ 0,114 Increase 0,261	I. 2,184 $\pm$ 0,107 II. 2,443 $\pm$ 0,115 Increase 0,259
Averages	I. 2,229 $\pm$ 0,112 II. 2,495 $\pm$ 0,114	I. 2,224 $\pm$ 0,112 II. 2,488 $\pm$ 0,115	I. 2,213 $\pm$ 0,108 II. 2,475 $\pm$ 0,115	I. 2,191 $\pm$ 0,103 II. 2,453 $\pm$ 0,114

As the passport age increased over the period from 36 to 55 years, VCL decreased by 0.029 cm<sup>3</sup> at 8 am, by 0.040 cm<sup>3</sup> at 12 noon, by 0.049 cm<sup>3</sup> at 4 pm, and

by 0.032 cm<sup>3</sup> at 8 pm. At the same time, it should be noted that positive verbal suggestion against the background of music resulted in almost the same increase in VCL. Thus, the level of the mean value (mesor) of VCL in women examined in a state of physiological rest on Monday was significantly ( $p<0.05$ ) lower than after combined positive suggestion against the background of music.

The amplitude of VCL fluctuations during the day was from 2.184 to 2.508 cm<sup>3</sup> in the state of physiological rest, which is explained by us, firstly, by the stability of the functioning of the respiratory system; secondly, the presence of the underlying disease - CHD, to some extent affecting the function of external respiration. And, finally, thirdly, a low level of motor activity due to being in a confined space. As for the VCL immediately after using the Ukhtomsky dominant, two points can be noted. Firstly, the VCL mesor during daylight hours in all women was significantly ( $p<0.05$ ) higher than in the state of physiological rest. Secondly, in absolute terms, it was practically at the level of identical numbers (fig. 1).



**Figure 1.** The level of the mean value (mesor) of VCL in women of the period of the second adulthood with CHD after the Covid-19 pandemic during the day on Monday at physical rest (I) and after the use of the Ukhtomsky dominant (II).

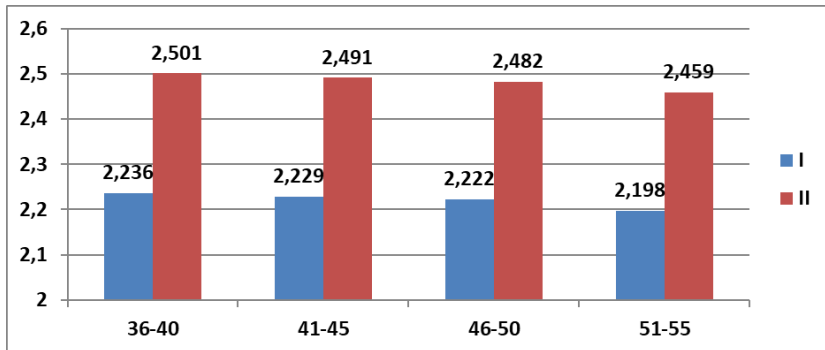
**Table 2.**

Chronobiological indicators of lung capacity in women aged 36 to 55 years on Wednesday in a state of physiological rest (I) and after combined (II) positive suggestion and music ( $M\pm m$ )

Time	Age			
	36-40	41-45	46-50	51-55
8 hours	I. 2,231±0,109	I. 2,227±0,111	I. 2,216±0,108	I. 2,202±0,102
	II. 2,496±0,112	II. 2,491 ±0,115	II. 2,479 ±0,116	II. 2,463 ±0,115
	Increase 0,265	Increase 0,264	Increase 0,263	Increase 0,261

12 hours	I. 2,239±0,110 II. 2,505±0,111 Increase 0,266	I. 2,231±0,112 II. 2,496±0,110 Increase 0,265	I. 2,228±0,109 II. 2,490 ±0,115 Increase 0,262	I. 2,198±0,103 II. 2,460 ±0,113 Increase 0,262
16 hours	I. 2,244±0,112 II. 2,507 ±0,118 Increase 0,263	I. 2,237±0,115 II. 2,498 ±0,117 Increase 0,261	I. 2,231±0,109 II. 2,491 ±0,115 Increase 0,259	I. 2,197±0,103 II. 2,458 ±0,114 Increase 0,261
20 hours	I. 2,232±0,112 II. 2,493 ±0,116 Increase 0,261	I. 2,223±0,112 II. 2,482 ±0,118 Increase 0,259	I. 2,214±0,108 II. 2,471 ±0,114 Increase 0,257	I. 2,198±0,107 II. 2,456 ±0,115 Increase 0,258
Averages	I. 2,236±0,110 II. 2,501 ±0,114	I. 2,229±0,112 II. 2,491 ±0,114	I. 2,222±0,108 II. 2,482 ±0,115	I. 2,198±0,103 II. 2,459 ±0,114

Analyzing the chronobiological indicators of VCL in women on the average day of the week, it can be noted that there are no significant differences ( $p>0.05$ ) in comparison with the indicators obtained on Monday (fig. 2).



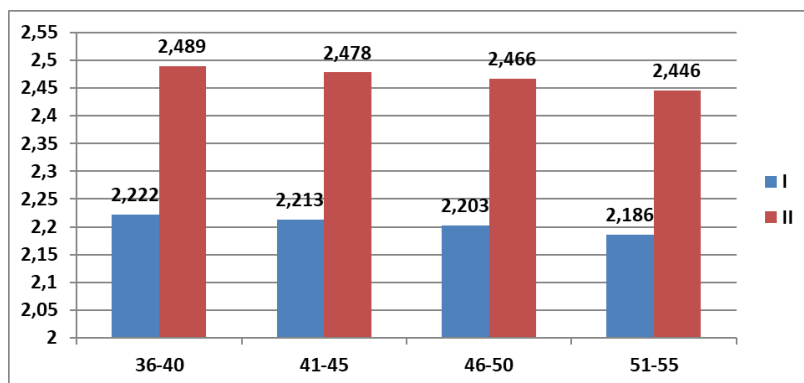
**Figure 2.** The level of the mean value (mesor) of VCL in women of the period of the second adulthood with CHD after the Covid-19 pandemic during the day on Wednesday at physical rest (I) and after the use of the Ukhtomsky dominant (II).

**Table 3.**

*Chronobiological indicators of lung capacity in women aged 36 to 55 years on Friday in a state of physiological rest (I) and after combined (II) positive suggestion and music ( $M \pm m$ )*

Time	Age			
	36-40	41-45	46-50	51-55
8 hours	I. 2,219 $\pm$ 0,108 II. 2,487 $\pm$ 0,112 Increase 0,268	I. 2,213 $\pm$ 0,110 II. 2,479 $\pm$ 0,113 Increase 0,266	I. 2,202 $\pm$ 0,108 II. 2,466 $\pm$ 0,114 Increase 0,264	I. 2,187 $\pm$ 0,102 II. 2,448 $\pm$ 0,115 Increase 0,261
12 hours	I. 2,227 $\pm$ 0,111 II. 2,492 $\pm$ 0,114 Increase 0,265	I. 2,218 $\pm$ 0,112 II. 2,482 $\pm$ 0,114 Increase 0,264	I. 2,209 $\pm$ 0,109 II. 2,472 $\pm$ 0,117 Increase 0,263	I. 2,193 $\pm$ 0,103 II. 2,454 $\pm$ 0,113 Increase 0,261
16 hours	I. 2,234 $\pm$ 0,112 II. 2,501 $\pm$ 0,117 Increase 0,267	I. 2,221 $\pm$ 0,115 II. 2,487 $\pm$ 0,118 Increase 0,266	I. 2,211 $\pm$ 0,109 II. 2,474 $\pm$ 0,116 Increase 0,263	I. 2,186 $\pm$ 0,103 II. 2,446 $\pm$ 0,114 Increase 0,260
20 hours	I. 2,211 $\pm$ 0,112 II. 2,476 $\pm$ 0,118 Increase 0,265	I. 2,202 $\pm$ 0,112 II. 2,466 $\pm$ 0,115 Increase 0,264	I. 2,191 $\pm$ 0,108 II. 2,453 $\pm$ 0,113 Increase 0,262	I. 2,178 $\pm$ 0,107 II. 2,436 $\pm$ 0,115 Increase 0,258
Averages	I. 2,222 $\pm$ 0,113 II. 2,489 $\pm$ 0,114	I. 2,213 $\pm$ 0,112 II. 2,478 $\pm$ 0,115	I. 2,203 $\pm$ 0,108 II. 2,466 $\pm$ 0,115	I. 2,186 $\pm$ 0,103 II. 2,446 $\pm$ 0,114

Giving an assessment of the VCL values during daylight hours on Friday, we note that we did not reveal significant differences in comparison with the previous days of the week ( $p > 0.05$ ). As on other days of the week, VCL after using the Ukhtomsky dominant was significantly ( $p < 0.05$ ) higher compared to the state of physiological rest (fig. 3).



**Figure 3.** The level of the mean value (mesor) of VCL in women of the period of the second adulthood with CHD after the Covid-19 pandemic during the day on Friday in a state of physical rest (I) and after the use of the Ukhtomsky dominant (II).

Thus, based on the study, the following **conclusions** can be drawn:

1. Self-isolation in the presence of a somatic disease in the form of CHD in the context of the Covid-19 pandemic is a kind of stress in the real life of a woman of the second period of adulthood, which occurs during her stay in conditions not only of a closed room, but also physical inactivity and hypokinesia, which is a prerequisite for changes in the mechanisms of regulation of the functioning of the cardiorespiratory system.

2. The presence of a number of cumulative factors: the age period of ontogenesis, approaching the elderly; the presence of a somatic long-term disease in the form of CHD; forced self-isolation due to the Covid-19 coronavirus pandemic and related relative hypokinesia; significantly contributed to the decrease in the resistance of the female body to hypoxia.

3. It can be stated that when conducting a chronobiological study of VCL in a state of physical rest during the day and week, the use of Ukhtomsky's dominant in the form of verbal hypnotic suggestion against the background of music contributes to its significant increase, even despite the Covid-19 pandemic and the presence of a somatic disease in the form of CHD.

4. Testing the body of women of the second period of mature age in chronobiological terms during the day and week allows us to conclude that at 12 and especially at 16 o'clock in the afternoon the respiratory system operates in a mode of high functionality, which should be taken into account during the treatment process.

**Conflict of interests.** The authors declare no conflict of interest.

**Research transparency.** The study was not sponsored. The authors are solely responsible for providing the final version of the manuscript for publication.

**Declaration of financial and other relationships.** All authors were involved in topic development, study design, and manuscript writing. The final version of the manuscript was agreed and approved by all authors. The authors did not receive a fee for the study.

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冠状病毒大流行背景下人群自我隔离态度的情绪特征

**EMOTIONAL FEATURES OF THE ATTITUDE OF THE  
POPULATION TO SELF-ISOLATION IN THE CONTEXT OF THE  
CORONAVIRUS PANDEMIC<sup>1</sup>**

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抽象的。自我隔离对一个人的影响的心理分析通常是在人际关系、生活的意义和质量、个人反应和社会孤独感的背景下考虑的。从动态、表达方式、心理障碍、抑郁和乐观等方面研究一个人的情绪状态。作者提议对社交网络用户的情绪进行研究。用于短文本分析的俄语语料库 RuTweetCorp, 使用 PyMorphy2 程序的词频分析, 情绪背景的评估是通过在 FastText 模型上训练的神经网络进行的, 以及在 RuSentiment 数据集上的 Dostoevsky 模型是作品中使用。

事实证明, 自我隔离被认为是生活中的一种强迫因素, 可能会给不同的人带来相反的经历, 这是由他们的心理偏好和生活状况决定的。用户最大的遗憾是时间的浪费、社交联系的减少、日常生活的不便、疾病本身的传播以及需要限制出门。积极情绪是由额外的放松机会引起的, 解决家庭问题。大多数用户的一般背景一般是负面的, 但并不明显。获得的结果表明有进一步研究的机会。

关键词: 自我隔离、人际关系、情感背景、俄语语料库分析、神经网络、经验差异、时间、社会接触、不适。

**Abstract.** *Psychological analysis of the impact of self-isolation on a person is often considered in the context of people's relationships, the meaning and quality of life, individual reactions, and social loneliness. The emotional states of a person are studied in terms of dynamics, means of expression, psychological disorders, depression and optimism. The authors propose a study of the emotions of users of social networks. The Russian-language corpus for the analysis of short texts RuTweetCorp, the frequency analysis of words using the PyMorphy2 program, the evaluation of the emotional background was made by a neural network trained on*

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<sup>1</sup> The study was carried out with the financial support of the Russian Foundation for Basic Research (RFBR) as part of a research project № 20-04-60177.



*the FastText model, and the Dostoevsky model on the RuSentiment dataset were used in the work.*

*As it turned out, self-isolation is perceived as a forced element of life and can cause opposite experiences for different people, which is determined by their psychological preferences and life situations. The greatest regrets among users are the wasted time, the decrease in social contacts, the inconvenience in everyday life, the spread of the disease itself and the need to limit leaving the house. Positive emotions are caused by additional opportunities to relax, solve domestic problems. The general background of most users is generally negative, but not pronounced. The results obtained indicate opportunities for further research.*

**Keywords:** *self-isolation, relationships, emotional background, Russian corpus of language analysis, neural network, differences in experiences, time, social contacts, discomfort.*

Self-isolation (quarantine, lockdown) as a phenomenon in human life is considered in various branches of the humanities. Studies of the features of the *psychological* impact of self-isolation on a person have also become a widely studied scientific problem. In this direction, one can point to the development of various problems that differ in structure, goals and directions of analysis: the *attitude* of Russians to the self-isolation regime (A.S. Vatoropin, M.N. Latu, E.I. Garaeva), the impact of self-isolation on a person's perception of *meaning of life* (S.M. Maltseva, O.V. Demakova., O.P. Kashina), features of the subjective assessment of the *quality of life* in conditions of self-isolation (Rubanova E.Yu.), *factors* that determine the individual reactions of residents of the metropolis to the regime of self-isolation (N. A. Tsvetkova, S.V. Pokrovskaya), *social loneliness* as an attribute of urban practices in the context of forced self-isolation (E.D. Korkia), *semantic* components in memes and demotivators dedicated to self-isolation (M.N. Latu).

In this series, it is possible to single out studies within specific *social groups* - these are the features of self-preservation behavior (A.V. Konobeyskaya) and factors of psychological well-being of *students* (M.V. Ivanova, I.L. Balymov), pedagogical risks of self-realization of *schoolchildren* (L.V. Zanina, O.A. Radchenko), self-isolation of the *elderly* (O.V. Fedosova., N.E. Kozyrenko). The literature also presents *ways* of coping with the situation of self-isolation during a pandemic (S.V. Frolova, Kh.A. Vysotskaya), although there are still few such works.

The study of the influence of self-isolation conditions on the *emotional* state of the individual was no exception. Among these works, one can note such as: the *dynamics* of the influence of self-isolation on the emotional state (N.N. Doronina, M.V. Lansikh, E.A. Ovsyanikova, etc.), drawing as a *means of expressing* the emotional state (I.B. Cheskidova), *anxiety disorders* as a result of self-isolation

(R.R. Bekselyaeva), features of mental states in conditions of self-isolation on *the eve of the session* (T.I. Kulikova), the impact of the lack of direct communication on the *level of depression* (Yu.P. Mesh, A.V. Boyko), *interpersonal sensitivity* during the period of self-isolation (N.A. Polskaya, A.Yu. Razvalyaeva), *optimism* as a resource for normalizing the mental state (I.I. Cheremiskina).

It is also important to pay attention to the fact that the study of psychological states through access to *internet-services* takes up little space, and the results of emotional analysis using *automated systems* are not presented at all, although it is possible to point out some studies of the problem close to digital analysis approaches: psychological problems of students in the *internet-environment* during the period of forced self-isolation (L.A. Regush, E.V. Alekseeva, O.R. Veretina, etc.), digital competencies of Russians and work in self-isolation (S.G. Davydov). Thus, the *object* of our research has become a still practically undeveloped direction related to the analysis of the emotional states of users of social networks (VKontakte and Odnoklassniki), and the *object* - is the texts of messages. The *purpose* of the study is to analyze the *emotional characteristics of the attitude* of social network users to self-isolation.

*Methodological approaches.* The appeal to the phenomenon of *attitude* is due to its characteristic features, which allow obtaining a diverse range of information through empirical analysis. Thus, relationships are formed in the process of a person's social development and change depending on specific social conditions, express his worldview attitudes, have a subjective (unique) character, influence real behavior and activity, allow assessing the significance of external influences, and its content components are self-organized in hierarchical system.

*Research methods.* As part of the study, an automated analysis of messages from social network users was carried out, the text of which contains the words "lockdown", "quarantine" and "self-isolation". A total of 3766 unique (non-recurring) messages were collected and processed. The study *used* the Russian-language corpus for the analysis of short texts RuTweetCorp (Rubtsova, 2012), and also performed a *frequency analysis* of selected words using the PyMorphy2 program (Korobov, 2015). To analyze the emotional background of messages, a neural network trained on the *FastText model* was used as a basic language model. The network is trained by the maximum likelihood method and is resistant to changes in endings (for more details, see Demidova, 2022). The evaluation of the *emotional tonality* of words was made using the *Dostoevsky model* on the *RuSentiment dataset* (for more on tonality, see: Dvoynikova, Karpov, 2020). The emotional background is studied within the framework of three modalities - positive, neutral and negative, in the numerical range from -1 to +1, with the scale divided into 20 units of uniform magnitude (for more details on the methods, see: Zhuravlev, Kitova, 2020; Kitova, Zhuravlev, 2022).

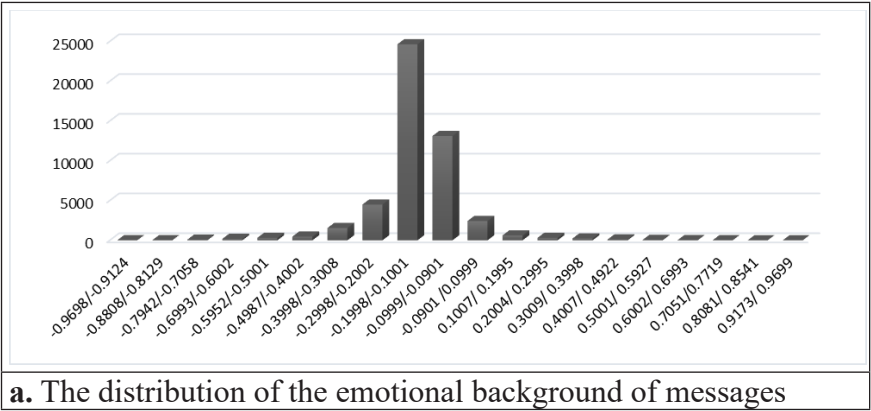
The material obtained allows us to produce both a quantitative and a qualitative section of the problem. In particular, Table 1 presents examples of words and their numerical values, as well as excerpts from texts with a negative, neutral and positive emotional background, the general *background of the message* is determined by calculating average values.

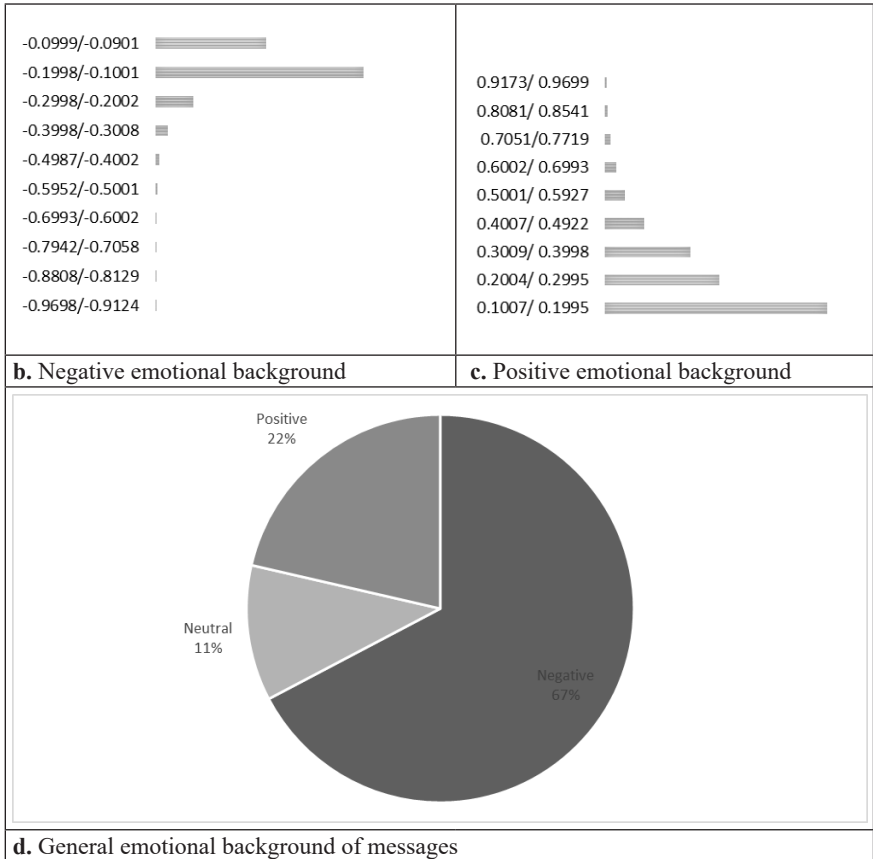
**Table 1.**  
*Emotional background of words in user messages about self-isolation*

№	The word and its evaluation	Excerpts from user posts	Background
1.	Tard (-0.7526)	– ...lockdown was invented by tards.	Negative
2.	Day (-0.056)	– All day long I just sleep, eat and draw. In fact, I'm just having fun. And absolutely nothing happens in life.	
3.	Country (-0.16299)	– ...it seems that quarantine is tough only in Asian countries, and this does not apply to the rest.	
4.	Month (-0.00101)	– Germany had the longest quarantine - 7 months of sitting at home.	Neutral
5.	Opportunity (0.00199)	– ... my group was quarantined for a week and this is a great opportunity to prepare for the session, I hope I can take advantage of this time.	
6.	Concert (0.02228)	– Do not be bored, sunshine, remember the concerts, our meetings, the latest movies. Self-isolation is temporary.	Positive
7.	Birth (0.04356)	– ... celebrated his birthday with his family, the quarantine will soon pass, and it will be possible to go somewhere.	
8.	Project (0.04901)	– ... with the number of projects in which I am now taking part, I will soon also stop sleeping and will dance all night long, but what, while quarantine can be for a change and misbehave.	

*Discussion of the obtained results.* A different background of emotional experiences in their quantitative expression is shown in fig. 1. As it turned out, self-isolation generates a wide range of experiences, which is distributed on 20 scales in the range  $-0.9698$  (the most negative assessments) to  $+0.9699$ . *The negative emotional background* (range from  $-0.0999$  to  $-0.0901$ ) is the most pronounced and surpasses all others (neutral and positive), both in quantitative characteristics

and in severity, which is easy to see on the graph (fig. 1a and more clearly, 1b). A qualitative (structural-content) analysis of these messages made it possible to identify several features. First, the most pronounced range of statements contains *expressive vocabulary* (range from -0.7526 to -0.37516). Expressions of this kind are most connected both with the *disease* itself (“... my head is splitting ... how nice it is to be sick, and even in quarantine”), and with the *need* to stay at home, for example: “it’s just “...”, how I want, for the quarantine to end, I don’t have the strength to stay at home at all ... because of my crazy family, I can’t even sleep normally. Why do I have to live like this! They (experiences) can also be caused by the *reverse* situation: “the whole group is sitting coughing, sniffing, sneezing, and quarantine is not announced, they are waiting until everyone gets sick, probably!”. There are also more *rational* determinants of such negative moods, for example, due to material restrictions: “... quarantine in winter is a cruel decision for a photographer. “I just have to sit without money for another 3-4 months!” Or even: “It is very strange to me that there are still lockdowns practiced in many places in the world. Guys, we have been living in this situation for two years already, have we really not figured out how to control it yet? Two years later!” Thus, negative assessments can be determined by the peculiarities of a person’s lifestyle, attachments to more being at home or away from home, and can also be provoked by social situations. Additional examples of statements are presented in table 1.





**Figure 1.** Emotional analysis of social network users' messages about self-isolation

It is important to note that *positive* emotions can also be caused by quarantine restrictions: “Thank God they introduced a lockdown (!), It was already unrealistic to watch people die in such numbers” or “Hurrah, quarantine ... you can stay at home, you can redo so many things” (fig. 1a and 1c). You can also point to disputes between representatives of supporters and opponents of social restrictions: “Your cause and effect seem to diverge. The lockdown is due to growth, the effect of reducing new cases is delayed for a couple of weeks, deaths are even longer.” *Neutral* statements are more informative, examples are also presented in table 1. Generally speaking, it can be noted that the number of negative assessments

exceeds the number of similar statements by supporters of social restrictions by more than 3 times. (fig. 1d). Positive assessments are also significant in magnitude (22.3%), these are primarily the positions of people with high social responsibility, with their supra-situational (non-personal) feelings about the well-being of society and other people.

The frequency analysis of words showed that the greatest experiences in connection with self-isolation among users are caused by wasted *time* (day - 225, week - 162, year - 146, time - 91, month - 50, hour - 36), “frozen” *social conditions* of life (country - 148, university - 137, school - 142, Russia - 69, work - 47, business - 40, business - 27), as well as the *discomfort* caused by the pandemic in people’s lives (persons - 195, children - 60, people - 44, people - 38), in the fourth place, users are worried about the *disease* itself and related situations (covid - 102, self-isolation - 70, test - 58, coronavirus - 51, omicron - 48, virus - 45, vaccination - 44, vaccination - 34 ) and only in 5th place are problems directly related to *quarantine* (self-isolation - 70, restrictions - 41, lockdown - 34).

Several main conclusions can be drawn from the *results* of the empirical study.

1. Self-isolation is perceived by users as a *forced* component of a person’s life and is often accompanied by a neutral nature of emotions or a reservedly negative background. Ignoring such a mode of behavior, according to these respondents, can lead to unjustified risks both for the person himself and for other members of society.

2. The need for self-isolation in different people can cause *different experiences*, both positive and negative, which is determined by their psychological preferences, for example, the desire to be more at home (in the family) or outside it, and also due to situational characteristics (for example, regret that the period of self-isolation coincided with illness, and staying at home did not create opportunities for additional rest).

2. *The greatest regrets* among users are caused by irrational or inappropriate use of time, a decrease in direct social contacts and the inconvenience caused by the pandemic in their usual way of life. Only after these positions are the experiences associated with the disease itself actualized (fear of getting sick, for example) and, then, in fifth place are negative positions associated with the need to limit one’s exit from the house.

3. *Positive emotions* are caused by additional opportunities to relax, solve household problems, do your favorite pastime (drawing, for example) and have a good time turning to entertainment in the online environment (watch concerts, streams, movies, etc.)

4. *The general background* of the attitude towards self-isolation among the majority of users (67%) is generally characterized as quite negative, but not very pronounced (distributed mainly in the first, minimum positions of the scale). One

fifth of the population is characterized by a neutral background of attitudes towards self-isolation (22%), which is explained by conscious responsibility, understanding of the current situation and its acceptance as a necessary measure. There is a small stratum of people (11%) who demonstrate positive emotional assessments associated with self-isolation, they are happy with the additional opportunity to manage their personal time and find exciting activities for themselves without leaving home.

*Conclusion.* The structural relationship of experiences (fears, hopes, expectations) within the framework of various types of emotional states is a promising research plan; this direction of analysis has not yet been adequately reflected in modern literature. In this vein, the qualitative (descriptive) detailing of the identified emotions, their psychological classification and interpretation are of interest. This kind of work can provide a lot of useful information in the field of awareness of all the feelings, emotions and experiences associated with the pandemic and may be useful in other types of emergencies. Thus, the research problem requires further investigation.

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严重合并颅脑损伤对学龄前心脏每搏量的影响

## INFLUENCE OF SEVERE CONCOMITANT TRAUMATIC BRAIN INJURY ON HEART STROKE VOLUME IN PRESCHOOL AGE

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抽象的。在严重伴随的创伤性脑损伤（SCTBI）后的第一天，视损伤的严重程度而定，SV 昼夜节律的中层有下降的趋势。PBP 的增加对应于 SV 的增加。在 3.1-7 岁 SCTBI 急性期，SV 和 DBP 之间的显着负相关表征了外周血管张力降低对心输出量的积极影响。SCTBI 越严重，心输出量越不稳定，被认为是急性心功能失代偿的表现之一。

关键词：严重合并外伤性脑损伤，心脏每搏输出量，学龄前年龄。

**Abstract.** *On the first day after a severe concomitant traumatic brain injury (SCTBI), there was a tendency to a decrease in the mesor of the SV circadian rhythm, depending on the severity of the injury. An increase in PBP corresponds to an increase in SV. Significantly significant inverse correlation between SV and DBP characterizes the positive effect of a decrease in peripheral vascular tone on cardiac output in the acute period of SCTBI at the age of 3.1-7 years. The more severe the SCTBI, the less stable the cardiac output was, which is considered one of the manifestations of acute cardiac decompensation.*

**Keywords:** *severe concomitant traumatic brain injury, stroke volume of the heart, preschool age.*

**Relevance.** *Factors of secondary brain damage (SBD) are not directly related to the mechanism of primary brain damage, but always develop later and lead to*



damage to the medulla, predominantly of the hypoxic-ischemic type. The most dangerous factors of SBD are arterial hypotension, hypoxia and intracranial hypertension (ICH). It is assumed that the starting pathophysiological mechanism in acute cerebral insufficiency, as the final link, is the formation of tissue hypoxia due to mitochondrial dysfunction. In accordance with the understanding of the pathophysiological mechanisms of cerebral damage, two areas of urgent measures for acute cerebral insufficiency are currently distinguished: restoration of cerebral perfusion and neuroprotective therapy. Restoration of cerebral perfusion includes taking active measures to restore and maintain systemic hemodynamics, restore adequate oxygenation, the level of volemia, and timely and adequate correction of intracranial hypertension using conservative and neurosurgical interventions [1–5]. Due to the lack of information on the characteristics of hemodynamic changes in severe concomitant traumatic brain injury in children of pre-preschool age (3.1–7 years), we tried to study the change in the structure of the phase characteristic and evaluate the response of the circadian rhythm of the stroke volume of the heart to a severe concomitant traumatic brain injury.

**Purpose of the work.** To study and evaluate the effect of severe concomitant traumatic brain injury on the stroke volume of the heart in preschool age.

**Material and research methods.** The results of monitoring of clinical and functional parameters, hemodynamics, including stroke volume of 34 children aged 3.1–7 years with SCTBI were studied. Of these, 12 children were assigned to a less severe group with a duration of intensive care in the ICU up to 10 days, patients with a duration of therapy of 11–20 days were included in group 2, and 10 patients with a duration of intensive care for more than 21 days were included in group 3. Male patients predominated in each group, amounting to 9 in group 1, 2–8 in group 3, and 8 boys in group 3 (table 1) aged 5.4–5.1 years on average. The cause of the injury was RTA in 9, 7, 10 children in groups, respectively, and a fall from a height in group 1 – 3 children, in 2–5 children. All patients admitted to the Republican Scientific Center for Emergency Medical Aid (RSCEMA) were operated on in the first hours after the injury, in extremely severe cases, with simultaneous urgent resuscitation and correction of serious violations of vital organs and systems measures (tab. 1).

**Table 1**  
*Characteristics of SCTBI patients admitted at the age of 3.1–7 years*

Groups	Num. of patients	Gender m/f	Age, years	RTA	Catatra-uma	Traum. shock of 2, 3 deg.	Oper. on admission	Num. of days in ICU	Num. of days in hospital
1	12	9/3	5.4±1	9	3	12	12	5.4±1.4	16.2±5.2
2	12	8/4	5.25±1.2	7	5	12	12	15±2.8	24±5.9
3	10	8/2	5.1±0.9	10	0	10	10	39.9±15.8	46±18.6

**Table 2***Duration of respiratory support*

Groups	CMV	IPPV	SIMV	CPAP	Spon. breath
1(12 pat)	2.2±1.4 (5)	-	3±1 day (2)	1 (1)	3.5±1.4 (12)
2 (12 pat)	6±3 (6)	2 (1)	7.6±2.8 (9)	3.2±1.5 hours (8)	5.4±2.7 (12)
3 (10 pat)	10.5±8.5 (6)	10.3±4.4(2)	14.7±8.6 (9)	6.6±2.8 (7)	15.8±8.9 (10)

As shown in tab. 2, almost all patients admitted to the clinic needed prosthetics for external respiration after a severe injury. Differences in the duration of ALV/AALV according to the severity of the condition were not identified. The determining factors in the severity of the condition of injured children in group 3 were severe CTBI (50%), severe OSTBI (50%), skull fracture with transition to the base (50%), SBC (100%), traumatic shock of 2-3 degrees (100%).

### **Results and its discussion.**

On the first day, a tendency to a decrease in the mesor of the circadian rhythm SV was revealed, depending on the severity of the injury (tab. 3). In group 1, there was a slight trend towards a decrease in SV on days 8-9. On the 7th day in injured children of the 2nd group, a decrease in the mesor of the circadian rhythm SV by 4 ml was observed (by 14%,  $p<0.05$ ).

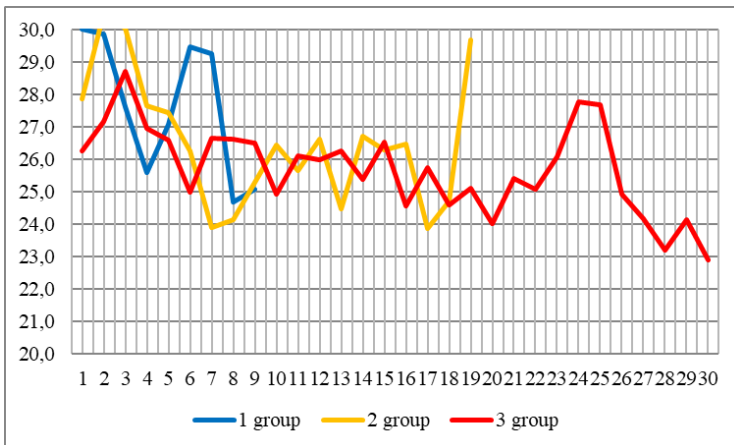
**Table 3.**

*Dynamics of the mesor of the circadian rhythm SV  
at 3.1-7 years with SCTBI, in ml*

Days	Group 1	Group 2	Group 3
1	30.0±2.4	27.9±2.2	26.3±1.6
2	29.9±1.2	30.5±1.3	27.2±1.3
3	27.6±0.9	30.0±1.4	28.7±1.2
4	25.6±1.9	27.7±1.0	27.0±1.3
5	27.1±1.2	27.4±2.0	26.6±1.3
6	29.5±2.7	26.2±1.5	25.0±1.4
7	29.3±2.9	23.9±0.9*	26.7±2.3
8	24.7±2.9	24.2±1.2	26.6±1.5
9	25.1±3.1	25.3±1.3	26.5±1.3
10		26.4±1.1	24.9±1.2
11		25.7±0.9	26.1±1.1
12		26.6±1.2	26.0±1.7
13		24.5±1.8	26.3±1.3
14		26.7±1.8	25.4±1.0
15		26.3±1.3	26.5±1.1
16		26.5±1.5	24.6±1.3
17		23.9±1.4	25.7±1.4

18		24.7±1.8	24.6±1.3
19		29.7±2.0	25.1±1.8
20			24.0±1.4
21			25.4±1.5
22			25.1±1.6
23			26.1±1.0
24			27.8±1.2
25			27.7±1.5
26			24.9±1.8
27			24.2±2.0
28			23.2±1.6
29			24.1±1.8
30			22.9±1.8

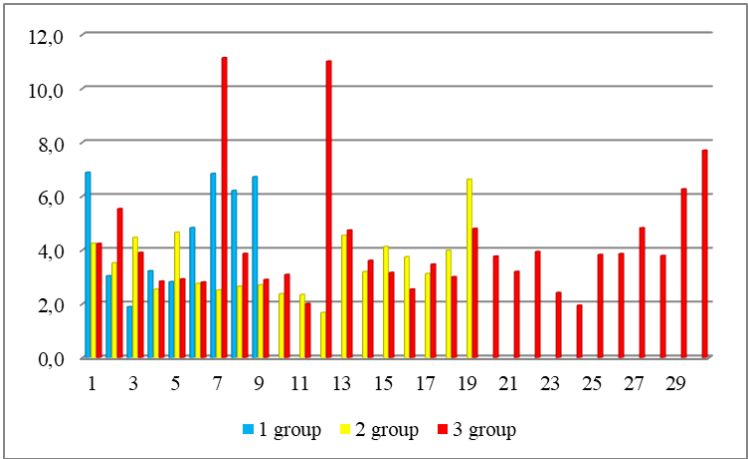
\*-the deviation is significant relative to the indicator on the first day



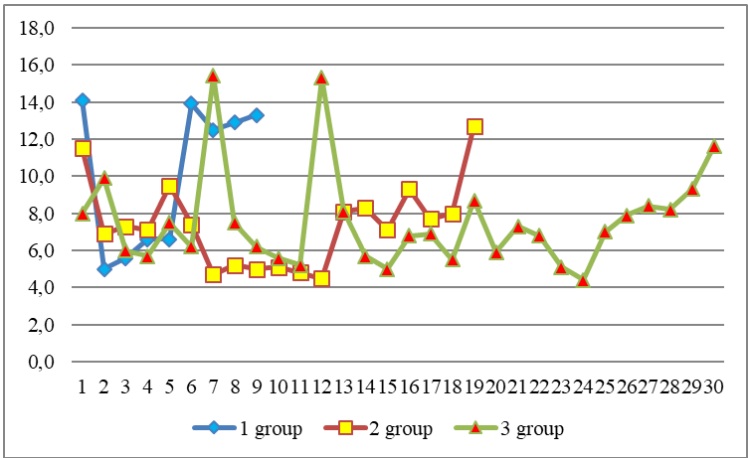
**Figure 1.** Dynamics of the mesor of the circadian rhythm SV at 3.1-7 years with SCTBI, in ml

The tendency to instability of cardiac output with a tendency to increase SV increased in group 1 on days 6-7, in group 2 on days 2,3,19, in group 3 on days 3 and 24 (fig. 1). The amplitude index of the circadian rhythm SV characterized the instability of the circadian rhythm of the SV index in the 1st group on days 1,7,8,9 reaching 7-6 ml, in the 2nd group -6.3 ml on the 19th day. The most significant changes in stroke volume were detected in group 3 on days 7, 12, 30, which amounted to 11, 11.7 ml, respectively. The range of daily changes in SV corresponded to changes in the amplitude of the SV circadian rhythm, reflecting

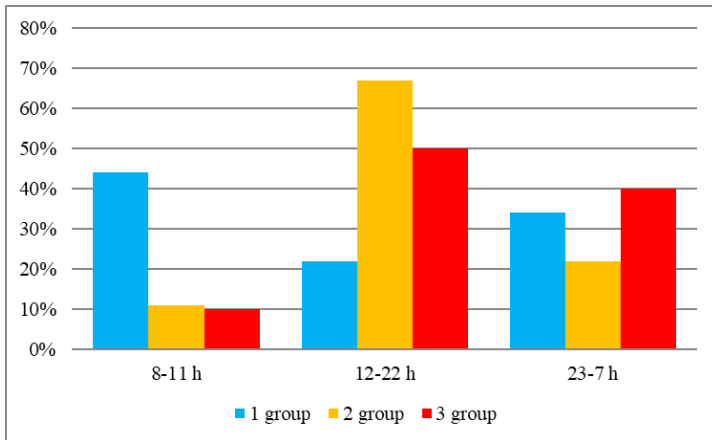
the maximum instability of cardiac output during the day in group 1 on days 1.7-9, reaching SV changes of 14-13 ml, in group 2 on days 1 and 19 amounting to 12 ml, in group 3 on days 7.12, amounting to 15 ml. That is, the more severe the SCTBI, the less stable the cardiac output was, which is considered one of the manifestations of acute cardiac decompensation (fig. 3).



**Figure 2.** Amplitude of the circadian rhythm SV in ml

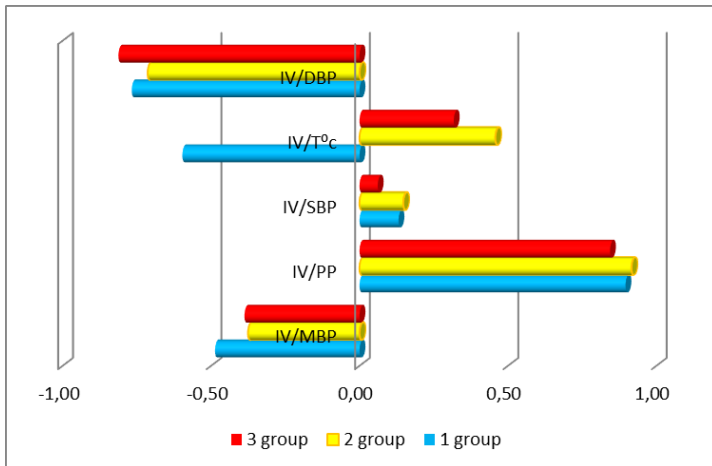


**Figure 3.** The range of daily fluctuations in SV, ml



**Figure 4.** Duration of shift of acrophases of the circadian rhythm SV in % of the duration of intensive care in the ICU.

The inversion of the SV circadian rhythm was the longest in children of group 3, accounting for 40% (12 days) of the duration of intensive care in the ICU, while in group 1, the shift in the peak of the acrophase of the SV circadian rhythm was detected for 34% (3 days), and in 2 - 22% (4 days). Thus, the severity of concomitant STBI corresponds to a tendency to increase stroke volume at night (fig. 4).



**Figure 5.** SV correlation connections

**Table 4.***Correlations of the mesor of the SV circadian rhythm*

	Group 1	Group 2	Group 3
SV/MBP	-0,49	-0,38	-0,39
SV/PBP	0,90	0,92	0,84
SV/SBP	0,13	0,15	0,06
SV/T	-0,60	0,46	0,32
SV/DBP	-0,77	-0,71	-0,81

As shown in fig.5, tab. 4, a strong direct relationship was found between SV and PBP in all patients. That is, in the acute period of SCTBI in children aged 3.1 to 7 years, the change in SV of the heart can be represented by the severity of the change in PBP, an increase in the PBP corresponds to an increase in SV. Significantly significant inverse correlation between SV and DBP characterizes the positive effect of a decrease in peripheral vascular tone on cardiac output within the limits of the identified fluctuations in SV and DBP in the acute period of SCTBI at the age of 3.1-7 years.

**Conclusion.** On the first day, a tendency to a decrease in the mesor of the SV circadian rhythm was revealed, depending on the severity of the injury. An increase in PBP corresponds to an increase in SV. Significantly significant inverse correlation between SV and DBP characterizes the positive effect of a decrease in peripheral vascular tone on cardiac output in the acute period of SCTBI at the age of 3.1-7 years. The more severe the SCTBI, the less stable the cardiac output was, which is considered one of the manifestations of acute cardiac decompensation.

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孕妇急性肾盂肾炎的现代治疗方法  
**MODERN APPROACH TO THE TREATMENT OF PREGNANT  
WOMEN WITH ACUTE PYELONEPHRITIS**

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抽象的。介绍了56例急性肾盂肾炎（AP）孕妇的检查和治疗结果。第1组（n=37）接受了标准量的治疗。在第2组（n=19）中，从第一天开始额外使用孕酮制剂（PP）。动态研究了子宫动脉的多普勒参数、激素浓度（黄体酮、皮质醇、硫酸脱氢表雄酮）。已经证明，使用PP可以及时、安全地纠正AP孕妇的激素和血流动力学障碍，通过降低产科并发症的发生率来提高治疗的有效性。

关键词：怀孕；急性肾盂肾炎；胎盘功能障碍；黄体酮制剂

**Abstract.** *The results of examination and treatment of 56 pregnant women with acute pyelonephritis (AP) are presented. Group 1 (n=37) received a standard amount of therapy. In group 2 (n=19) progesterone preparations (PP) were additionally used from the 1st day. Doppler parameters of the uterine arteries, hormone concentrations (progesterone, cortisol, dehydroepiandrosterone sulfate) were studied in dynamics. It has been proven that the use of PP allows timely and safe correction of hormonal and hemodynamic disorders in pregnant women with AP, increases the effectiveness of therapy by reducing the incidence of obstetric complications.*

**Keywords:** *pregnancy; acute pyelonephritis; placental dysfunction; progesterone preparations*

The problem of managing pregnant women with extragenital diseases continues to be the focus of attention of many scientists due to the direct impact of acute or chronic pathology on maternal and perinatal mortality [1, 2]. According to the

literature, acute pyelonephritis (AP) ranks second in the structure of somatic pathology in pregnant women, while its frequency has increased in recent years and varies from 3-18% to 38.8% [3, 4]. Noteworthy is the fact that the occurrence of AP can lead to the development of purulent-inflammatory changes in the kidneys in every third case, urodynamic disorders (40%), septic shock (10.3%), increasing mortality among pregnant women up to 10%. [3, 5]. In addition, in pregnant women with AP, the likelihood of various complications of gestation and early delivery increases [3, 6].

Purpose: to evaluate the effectiveness of the use of progesterone drugs in the treatment of pregnant women with AP.

Material and methods. 56 pregnant women with AP were under observation at terms from 8 to 32 weeks. The study was conducted with the permission of the ethical committee of Saratov State Medical University named after V.I. Razumovsky and after obtaining the voluntary informed consent of pregnant women for examination and treatment. In the 1st group (n=37), the conventional scope of AP treatment was used, including antibacterial drugs, antispasmodics, herbal medicine, and renal stenting as indicated. In the 2nd group (n=19), progesterone preparations (micronized progesterone 100 mg or dydrogesterone 10 mg every 12 hours, orally) were used in the complex of AP therapeutic measures from the 1st day daily, according to the instructions. At the same time, after the 20th week of gestation, preference was given to prescribing micronized progesterone until the period of 37.1 weeks (patent for invention № 2694514 dated March 21, 2018) [7]. Criteria for inclusion in the 1st and 2nd groups: singleton pregnancy, gestational age from 4 to 32 weeks, clinical and laboratory signs of AP. Exclusion criteria: multiple pregnancy, gestational age more than 32 weeks, AP of a single kidney, severe genital and extragenital pathology in the mother, congenital malformations of the fetus. Pregnant women in the groups were comparable in age, concomitant genital pathology and the presence of extragenital diseases.

In the program of examination of women, an ultrasound examination (USE) was performed with dopplerometry on a premium digital scanner Voluson E8 (GE Healthcare) using convex probes C1-5-D, 4D RAB6-D and intracavitary probe IC5-9-D with frequencies from 2 up to 9 MHz. Additionally, the hormonal profile of pregnant women was assessed by enzyme-linked immunosorbent assay (ELISA) with the determination of progesterone (P), cortisol (C) in the blood serum - kits from Alkor-Bio (RF), and dehydroepiandrosterone sulfate (DEAS) - commercial kits from "Bio-Glad".

For statistical analysis, Excel MS Office Professional and Statistica 6.0 programs were used. The hypothesis was tested for the normality of the initial data using the Kolmogorov-Smirnov test, while the distribution of features was normal. The results were presented as means (M) and standard deviation (SD). When



evaluating qualitative indicators, the absolute and relative frequencies of observations (n, %) were calculated. Differences between the two mean values of the parameters were assessed by Student's t-test, qualitative - by Fisher's  $\chi^2$  test (differences were considered statistically significant at  $p < 0.05$ ).

Results of the study and their discussion.

The age of women was in the range from 18 to 32 years and the average age in the groups had no significant differences (1st group - 25.6 (5.9) years; 2nd group - 23.5 (7.1) years;  $p = 0.82$ ). In addition, patients of all groups were comparable in terms of gestational age: in the range from 8 to 21.6 weeks, AP was diagnosed in 10 patients (27.0%) in group 1 and 5 (26.3%) in group 2. th ( $p = 0.95$ ), in other observations, the duration of pregnancy in the event of urological pathology varied from 22 to 32 weeks. The data obtained are consistent with the opinion of many researchers about the increased likelihood of developing AP in the second half of pregnancy [4, 8, 9]. According to our data, the proportion of pregnant women with AP at terms of 22-32 weeks was 2.8 times higher than the frequency of diagnosing this pathology at terms of 8-21.6 weeks ( $p < 0.001$ ).

As is known, in addition to infectious and mechanical factors in the occurrence of pathological changes in the upper urinary tract during pregnancy, the hormonal theory also plays an important role in the pathogenesis of gestational pyelonephritis, explaining the risk of the disease by urodynamic disorders, in the form of a decrease in tone and expansion of the ureters, against the background of an increase in the blood levels of progesterone and glucocorticoid hormones in pregnant women [9]. At the same time, there is no doubt how important the synthesis and secretion of steroid hormones are during normal pregnancy and miscarriage [10, 11]. The results of our previous studies showed a decrease in the blood serum of pregnant women with AP in the concentration of P against the background of an increase in the levels of stress hormones C and DEAS [12]. It has been proven that the content of steroid hormones directly depends on the gestational age. In this regard, in order to obtain relatively objective data when calculating the average values of the studied parameters in each group of women, 2 subgroups were identified, taking into account the gestational age: 8-21.6 and 22-32 weeks (table 1).

The results of a comparative analysis of the features of hormonal homeostasis showed that when using conventional methods of treating pregnant women with AP (Group 1), there is a decrease in serum P concentration (by 1.3 times on days 4-5 compared with baseline parameters) against the background of a slight increase in C and a significant increase in DEAS after 22 weeks ( $p = 0.003$ ). A significant increase in stress hormones in AP, in our opinion, can be explained by the protective reaction of the body of a pregnant woman in response to the onset of pain, hyperthermia and stress caused by the onset of acute urological pathology. A drop in the level of P in the blood of pregnant women with AP is a direct manifestation of placental dysfunction, which is confirmed by numerous studies [13, 14].

**Table 1**

*Results of a dynamic study of steroid hormones in pregnant women with acute pyelonephritis*

Parameters under study	Gestation period	Group 1 (n=19)	Group 2 (n=37)	$p^{1-2}$
	weeks	M (SD)	M (SD)	
Progesterone (ng/ml) - on admission	8-21,6	n=10 51,93 (4,3)	n=5 52,31 (3,4)	0,95
4-5th day of treatment	8-21,6	38,47 (4,1) p=0,04	58,29 (3,6) p=0,27	0,003
Progesterone (ng/ml) - on admission	22-32	n=27 85,63 (4,7)	n=14 86,22 (5,6)	0,93
4-5th day of treatment	22-32	63,43 (3,5) p<0,001	98,74 (5,2) p=0,11	<0,001
Cortisol (ng/ml) - on admission	8-21,6	n=10 166,83 (7,4)	n=5 167,23 (5,3)	0,97
4-5th day of treatment	8-21,6	181,35 (9,4) p=0,24	135,16 (4,2) p=0,002	0,001
Cortisol (ng/ml) - on admission	22-32	n=27 243,76 (11,3)	n=14 244,14 (6,1)	0,97
4-5th day of treatment	22-32	264,16 (11,7) p=0,22	199,73 (6,3) p<0,001	<0,001
DEAS (mcg/ml) - on admission	8-21,6	n=10 1,05 (0,04)	n=5 1,07 (0,02)	0,66
4-5th day of treatment	8-21,6	1,21 (0,05) p=0,02	0,88 (0,02) p<0,001	<0,001
DEAS (mcg/ml) - on admission	22-32	n=27 0,94 (0,05)	n=14 0,95 (0,03)	0,86
4-5th day of treatment	22-32	1,12 (0,03) p=0,003	0,82 (0,03) p=0,005	<0,001

A completely different picture of the dynamic control of steroid hormones during the complex therapy of AP was traced in the 2nd group (table 1). We did not find significant changes in the level of P in the blood serum of patients on the 4-5th day. At the same time, the concentrations of C and DEAS in this group in dynamics significantly decreased in comparison with the initial data, and the obtained average values on days 4-5 in the 2nd group were lower than those in the 1st group.

Analysis of the primary USE protocols allowed us to exclude severe obstetric pathology. In all pregnant women in the groups, the size of the embryo (fetus) corresponded to gestational age, fetal growth retardation (FGR), and markers of chromosomal abnormalities in fetal development were not found in any observation. Dopplerometry showed Ia degree uteroplacental blood flow disorders (UPB-

FD) at admission and during treatment of patients with AP in isolated cases: group 1 - 5.4% (n=2); 2nd group - 5.3% (n=1).

However, within 2-4 weeks after the completion of AP therapy in the 1st group of UPBFD, Ia degree was already diagnosed in 19 women (51.4%;  $p<0.001$ ), and degree II - in 6 (16.2%). In addition, 1 month after AP, in 16 pregnant women of the 1st group with USE, signs of premature maturation of the placenta were visualized (43.2%;  $p<0.001$ ), in 11 - FGR (27.8%;  $p=0.009$ ), in 12 - pathology of the volume of amniotic fluid (32.4%;  $p<0.001$ ), while in the 2nd group, UPBFD Ia degree and polyhydramnios were traced in single observations (table 2).

**Table 2**  
*Features of the course and outcomes of pregnancy depending on the treatment option for acute pyelonephritis*

Indicator	Group 1 (n=37)		Group 2 (n=19)		$p^{1-2}$
	n	%	n	%	
Uteroplacental blood flow disorders Ia degree	19	51,4	1	5,3	<0,001
Impaired uteroplacental blood flow II degree	6	16,2	0	0	0,06
Premature maturation of the placenta	16	43,2	0	0	<0,001
Fetal growth retardation	11	27,8	0	0	0,009
Oligohydramnios	6	16,2	0	0	0,06
Polyhydramnios	6	16,2	1	5,3	0,24
Edema	14	37,8	5	26,3	0,39
Gestational arterial hypertension	15	40,5	2	10,5	0,02
Moderate preeclampsia	9	24,3	0	0	0,02
Severe preeclampsia	5	13,5	0	0	0,09
Premature rupture of membranes	13	35,1	3	15,8	0,13
Preterm birth	11	27,8	1	5,3	0,03
C-section	12	32,4	2	10,5	0,07

When monitoring pregnant women after AP, a high proportion of gestational complications in the 1st group was noted (table 2). Thus, the frequency of development of gestational arterial hypertension in this group was statistically significantly higher than that of the 2nd group (3.9 times), edematous syndrome - 1.4 times (in the absence of a significant difference in intergroup values), and complications in the form of moderate and severe preeclampsia was diagnosed only in the 1st group, accounting for 24.3 and 13.5% of cases, respectively.

In addition, in the 1st group, preterm birth (PR) was stated 5 times more often than in the 2nd group. Premature rupture of the membranes occurred in 35.1% of women in the 1st group, which was 2.2 times higher than in the 2nd group, and the risk of operative delivery in the 1st group increased by 3 times, but in the absence of significant statistical differences between these studied parameters (table 2).

Additional and prolonged use of progesterone preparations from the 1st day of generally accepted therapeutic measures for AP contributed to a significant reduction in the incidence of pregnancy complications and preterm birth. It should be emphasized that according to the world literature, the positive effects of progesterone preparations discovered in recent years make them literally indispensable in obstetrics for the prevention and treatment of preterm birth [15, 16].

**Conclusions.** 1. The occurrence of AP during pregnancy leads to desynchronization of the synthesis of steroid hormones, disorders of uteroplacental blood flow, increasing the frequency of formation of premature maturation of the placenta (43.2%), amniotic fluid pathology (32.4%), fetal growth retardation (27.8%), gestational hypertension (40.5%), preeclampsia (37.8%) and preterm birth (27.8%).

2. Early inclusion of progesterone preparations in the complex of therapeutic measures for AP increases the effectiveness of therapy by correcting hormonal disorders of the uterine-fetal-placental complex, thereby preventing the progression of placental dysfunction, reducing the incidence of complications and early termination of pregnancy.

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3.1-7岁儿童严重合并脑外伤急性期的分钟血液循环量的昼夜节律  
**CIRCADIAN RHYTHM OF MINUTE VOLUME OF BLOOD  
CIRCULATION IN THE ACUTE PERIOD OF SEVERE  
CONCOMITANT TRAUMATIC BRAIN INJURY IN CHILDREN OF  
3.1-7 YEARS OF AGE**

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抽象的。在严重伴随的颅脑损伤后的第一天和随后几天的强化治疗,在第 1 组中未检测到 CO 昼夜节律中值的显著偏差。在第 3 组中,在第 3 组中发现昼夜节律中值 CO 降低 第 30 天下降 24%,这与根据适应症限制液体给药的权宜之计有关,这会增加发生心力衰竭的风险。发现第 3 组中 CO 昼夜节律的幅度和昼夜范围的最显著偏差是由于与调节皮质下血管舒缩和呼吸中枢功能活动的脑损伤严重程度相关的违规行为。

关键词: 昼夜节律, 每分钟血液循环量, 严重合并颅脑损伤, 儿童。

**Abstract.** *On the first day after a severe concomitant traumatic brain injury and subsequent days of intensive therapy, no significant deviations in the CO circadian rhythm mesor were detected in group 1. In group 3, a decrease in the mesor of the circadian rhythm CO was found on day 30 by 24%, which is associated with the expediency of limiting fluid administration according to indications, with an increased risk of developing heart failure. The most significant deviations in the amplitude and diurnal range of the CO circadian rhythm in group 3 were found to be due to a violation associated with the severity of brain damage that regulates the functional activity of the subcortical vasomotor and respiratory centers.*

**Keywords:** *circadian rhythm, minute volume of blood circulation, severe concomitant traumatic brain injury, children.*

**Relevance.** Traumatic brain injury among other damage to the human body reaches 30-50%. According to the WHO, it is growing by 2% annually. Violations of the vital functions of the body and the resulting multiple organ pathology in severe traumatic brain injury in children have not been studied enough. The figures inform that without fear for the state of the body, a three- to four-fold increase in CO, which is observed at rest, is possible. In people who systematically go in for sports and are well developed physically, this figure can exceed 700%. When the body is in a horizontal position and any physical activity is excluded, CO is in the range from 4 to 5.5 (6) l/min. The amount of blood filling the circulatory system of a normal adult is 5-6 liters. One minute is enough to complete a complete circuit. With heavy physical work, increased sports loads, the CO level of an ordinary person rises to 30 l/min, and for professional athletes even more - up to 40. In addition to physical condition, CO indicators largely depend on: systolic blood volume; heart rate; functionality and condition of the venous system through which blood returns to the heart. When blood passes through the capillaries, the blood plasma is completely renewed with interstitial (tissue) fluid 40 times. There is little information in the literature regarding rational intensive care for general, cerebral circulatory hypoxia of brain cells, the choice of anesthesia method, taking into account the age characteristics of the child's body and the severity of damage to the central nervous system. The principle of dynamic control over the functional state of vital organs and systems has not yet found wide application in the intensive care of neurotraumatological sick children [1-4].

**Purpose of the work.** To study and evaluate changes in the circadian rhythm of cardiac output in the acute period of SCTBI in children aged 3.1-7 years.

**Material and research methods.** The data of CO monitoring in 34 children aged 3.1-7 years were studied. Of these, 12 children were assigned to a less severe group with a duration of intensive care in ICU conditions up to 10 days, patients with a duration of therapy of 11-20 days were included in group 2, and 10 patients in group 3 received intensive therapy for more than 21-30 days or more. Male patients predominated in each group, amounting to 9 in group 1, 2-8 in group 3, 8 boys in group 3 (tab. 1) aged 5.4-5.1 years. The cause of the injury was RTA in 9, 7, 10 children in groups, respectively, and a fall from a height in 1-3 children, and in group 2 5 children. All patients admitted to RSCEMA were operated on in the first hours after the injury, in extremely severe cases, with simultaneous, urgent resuscitation and correction of serious disorders of vital organs and systems (tab. 1).

**Table 1***Characteristics of SCTBI patients admitted at the age of 3.1-7 years*

Groups	Num. of patiants	Gender m/f	Age, years	RTA	Catatra-uma	Traum. shock 2,3 deg	Oper. on the day of adm.	Num. of days in ICU	Num. of days in days
1	12	9 /3	5.4±1	9	3	12	12	5.4±1.4	16.2±5.2
2	12	8/4	5.25±1.2	7	5	12	12	15±2.8	24±5.9
3	10	8/2	5.1±0.9	10	0	10	10	39.9±15.8	46±18.6

**Table 2***Duration of respiratory support*

Groups	CMV	IPPV	SIMV	CPAP	Spont breath
1(12 pat.)	2,2±1,4 (5)	-	3±1 day (2)	1 (1)	3,5±1,4 (12)
2 (12 pat.)	6±3 (6)	2 (1)	7,6±2,8 (9)	3,2±1,5 hours (8)	5,4±2,7 (12)
3 (10 pat.)	10,5±8,5 (6)	10,3±4,4(2)	14,7±8,6 (9)	6,6±2,8 (7)	15,8±8,9 (10)

As presented in tab. 2, almost all patients admitted to the clinic needed prosthetics for external respiration after a severe injury. Differences in the duration of ALV/AALV according to the severity of the condition were not identified. The determining factors in the severity of the condition of injured children in group 3 were severe CTBI (50%), severe OTBI (50%), skull fracture with transition to the base (50%), SBC (100%), traumatic shock grades 2-3 (100%).

The research data were processed by the method of variation statistics using the Excel program by calculating the arithmetic mean values (M) and the errors of the means (m). To assess the significance of differences between the two values, Student's parametric test (t) was used. The relationship between the dynamics of the studied indicators was determined by the method of pair correlations. The critical significance level was taken equal to 0.05.

**Results and its discussion.** Conducted emergency corrective, stress-limiting therapy allowed in 1 day after the injury to bring the value of the mesor of the circadian rhythm CO as close as possible to age indicators with a continuing upward trend (tab. 3). In the following days of intensive therapy in group 1, no significant deviations of the CO circadian rhythm mesor were detected. In group 2, on days 7, 13, and 15, a decrease in the mesor of the circadian rhythm CO was noted relative to the indicator on the first day by 18%, 18%, 15% ( $p<0.05$ , respectively). In group 3, a decrease in the mesor of the circadian rhythm CO was found on the 30th day by 24% ( $p<0.05$ ). Attention is drawn to the almost synchronous dynamics of CO in the first 5 days in all examined patients, followed by continued fluctuations with a wavelength in group 1 of about 4 days, in group 2 - 5,4,4 days. In group 3,



after stabilization at the level of 3 l/min on days 24-29, a gradual decrease in the mesor of the circadian rhythm CO by 0.8 l was revealed, which is most likely due to the expediency of limiting fluid administration according to indications (fig. 1).

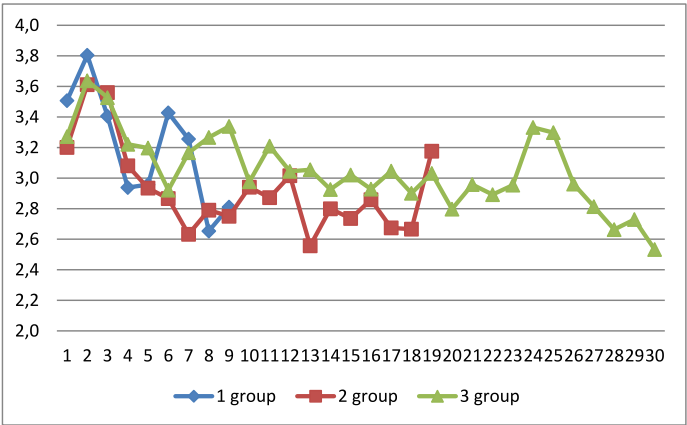
**Table 3**  
*Dynamics of the mesor of the circadian rhythm CO (l/min) in children from 3.1 to 7 years old with STBI.*

Days	Group 1	Group 2	Group 3
1	3.5±0.4	3.2±0.3	3.3±0.3
2	3.8±0.2	3.6±0.2	3.6±0.2
3	3.4±0.1	3.6±0.3	3.5±0.2
4	2.9±0.2	3.1±0.2	3.2±0.2
5	3.0±0.1	2.9±0.1	3.2±0.2
6	3.4±0.3	2.9±0.2	2.9±0.2
7	3.3±0.3	2.6±0.1*''	3.2±0.2
8	2.7±0.3	2.8±0.2	3.3±0.2'''
9	2.8±0.3	2.8±0.2	3.3±0.2
10		2.9±0.1	3.0±0.2
11		2.9±0.1	3.2±0.2
12		3.0±0.2	3.0±0.2
13		2.6±0.2*	3.1±0.2
14		2.8±0.2	2.9±0.1
15		2.7±0.1*	3.0±0.2
16		2.9±0.2	2.9±0.2
17		2.7±0.2	3.0±0.3
18		2.7±0.3	2.9±0.2
19		3.2±0.2	3.0±0.3
20			2.8±0.2
21			3.0±0.2
22			2.9±0.2
23			3.0±0.2
24			3.3±0.2
25			3.3±0.2
26			3.0±0.3

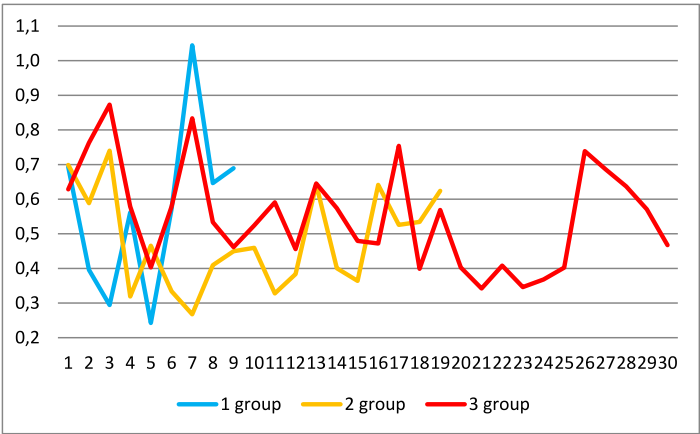
27			2.8±0.3
28			2.7±0.3
29			2.7±0.2
30			2.5±0.2*

\*-reliable relative to the indicator in 1 day

'''-the difference is significant relative to the indicator in group 1

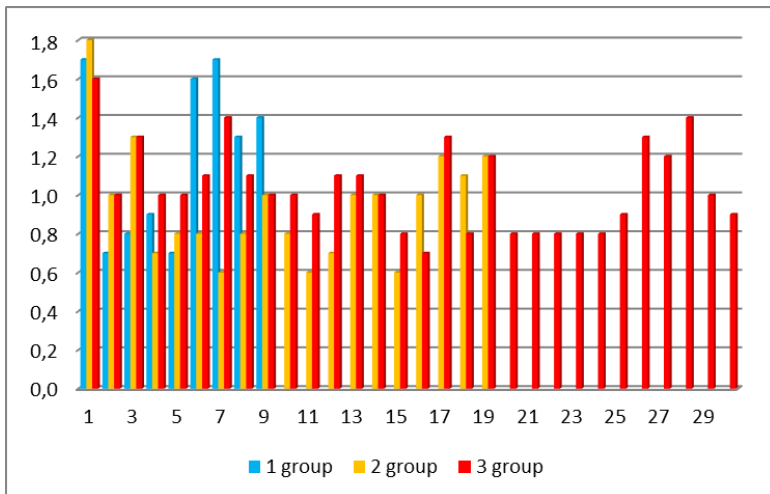


**Figure 1.** Mesor dynamics of CO circadian rhythm in SCTBI at preschool age



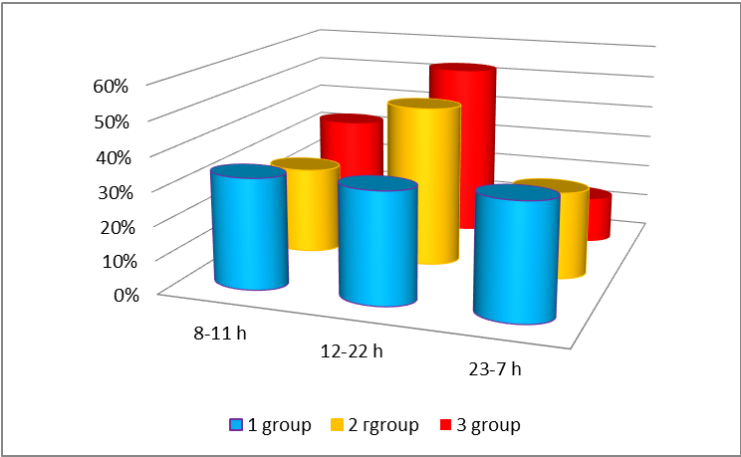
**Figure 2.** Circadian rhythm amplitude CO

The dynamics of the amplitude of daily fluctuations in CO characterizes the most pronounced instability in group 1, where the amplitude indicator was 1.2 l/min on day 7, which can be explained by the restriction of stress-protective therapy before transfer to another department (fig. 2). In group 2, the highest value of the amplitude of the circadian rhythm CO was noted on days 3, 13, 16, which amounted to 0.72 l per min, 0.63 l/min, 0.63 l/min. During the entire acute period of SCTBI, CO instability was observed in children of the 3rd group, where the amplitude of the daily CO rhythm was on the 3rd day - 0.88 l/min, on the 7th day 0.82 l/min, on the 17th day - 0.76 l/min, on the 27th day 0.72 l/min. The most significant deviations revealed in the 3rd group are due to the impairment of the regulatory functional activity of the subcortical vasomotor and respiratory centers due to the severity of brain damage.



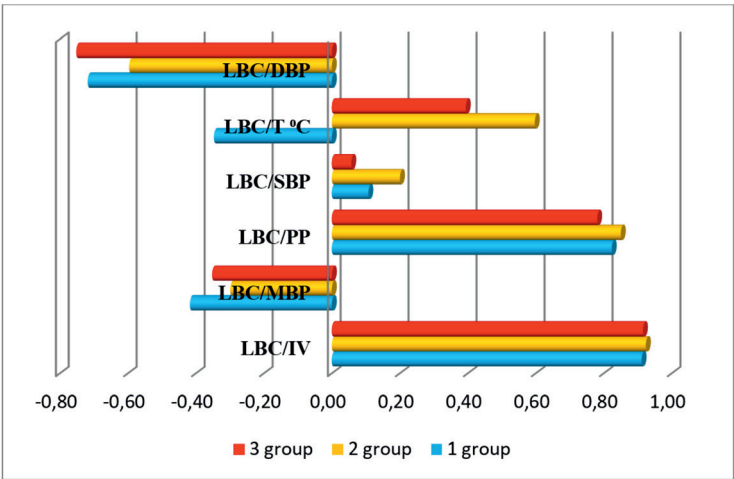
**Figure 3.** Daily range of CO changes at age 3.1-7 years

Amplitude changes depending on the severity of traumatic brain injury are confirmed by the dynamics of daily changes in CO (fig. 3), amounting to 1 group in 1, 6, 7, 9 days 1.7 l/min, 1.6 l/min, 1.7 l/min, 1.4 l/min, respectively. In group 2, the daily range of CO fluctuations was 1.8 l/min on day 1, 1.3 l/min on day 3, and 1.2 l/min on day 17. Large changes in CO during the day in children of the 3rd group continued on days 26, 27, 28 (1.3 l/min, 1.2 l/min, 1.4 l/min). The revealed features of daily changes in CO in group 3 indicated a hyperdynamic type of blood circulation due to the severity of secondary factors with a tendency to heart failure.



*Figure 4. Duration of shift of acrophases of circadian rhythm of CO*

In groups 2 and 3, a moderate shift in the peak of the acrophase of the circadian rhythm CO within the daytime prevailed, amounting to 48% in group 2, and 53% of the duration of the acute period of SCTBI in group 3 (fig. 4).



*Figure 5. Correlation links of CO*

The inverse correlation between CO and DBP indicates a hyperdynamic direction of hemodynamic changes in the acute period of SCTBI. The direct correlation

between CO and SV is due to the predominance of the involvement of the stroke volume of the heart in the change in CO, in contrast to infants. The change in the mesor of the circadian rhythm PBP is consistent with the unidirectional change in CO in all injured aged 3.1-7 years. That is, an increase in PBP indicates an increase in CO (tab. 4) in the children under study.

**Table 4.**  
*Correlation links of CO*

	Group 1	Group 2	Group 3
CO/SV	0,91	0,92	0,92
CO/MBP	-0,42	-0,30	-0,35
CO/PBP	0,82	0,85	0,78
CO/SBP	0,11	0,20	0,06
CO/T°C	-0,35	0,60	0,39
CO/DBP	-0,72	-0,60	-0,75

**Conclusion.** No significant deviations in the CO circadian rhythm mesor were detected in group 1 on the first post-injury and subsequent days of intensive therapy. In group 3, a decrease in the mesor of the circadian rhythm CO was found on day 30 by 24%, which is associated with the expediency of limiting fluid administration according to indications, and an increased risk of developing heart failure. The most significant deviations in the amplitude and diurnal range of the CO circadian rhythm in group 3 were found to be due to a violation associated with the severity of brain damage that regulates the functional activity of the subcortical vasomotor and respiratory centers.

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酞菁锌和基于它的抗癌药物  
**THE ZINC PHTHALOCYANINE AND AN ANTI-CANCER DRUG  
ON THE BASIS IT**

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抽象的。药物的制备技术 – 治疗皮肤和粘液癌的热传感器是脉冲激光热疗方法的变体之一 – 脉冲激光烧蚀纳米粒子 (PLAN)。该药物是一种稳定的酞菁锌纳米分散体。

具有血流的药物纳米颗粒进入肿瘤，然后用脉冲激光照射肿瘤，吸收激光辐射长度的光的纳米颗粒发生爆炸，从而破坏肿瘤组织及其毛细血管血液系统，从而导致压迫肿瘤，它的退化和死亡。

该技术包括大结晶酞菁锌的两级分散。第一阶段是以盐为研磨晶体，研磨成重型混合机；第二阶段是在表面活性剂存在下通过超声波分散。

该药物成功通过了动物临床前试验。

关键词：皮肤和粘液癌，纳米分散体，酞菁锌，脉冲激光，热传感器，纳米粒子脉冲激光消融 (PLAN)，肿瘤，光动力治疗方法 (PDT)。

**Abstract.** *The technology of preparation of the drug - thermosensor in the treatment of cancer of the skin and mucous one of the variants of the method of pulsed laser hyperthermia – pulsed laser ablation of nanoparticles (PLAN). The drug is a stable nanodispersion of zinc phthalocyanine.*

*Nanoparticles of the drug with blood flow enter the tumor, after which the tumor irradiated with a pulsed laser, nanoparticles that absorb light at the laser radiation length, explode, thereby destroying the tumor tissue and its capillary blood system, which leads to the oppression of the tumor, its degradation and death.*

*The technology consists in two-stage dispersion of large-crystalline zinc phthalocyanine. The first stage is grinding into heavy-type mixers using salts as grinding crystals; the second stage is dispersing by ultrasound in the presence of surfactants.*

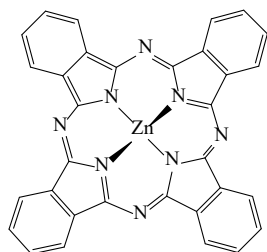
*The drug successfully passed preclinical tests on animals.*

**Keywords:** *cancer of the skin and mucous, nanodispersion, zinc phthalocyanine, pulsed laser, thermosensor, Pulsed Laser Ablation of Nanoparticles (PLAN), tumor, PhotoDynamic Therapy methods (PDT).*

There is a method of treating malignant skin tumors with laser hyperthermia. In this case, the laser beam should heat a substance in the form of nanoparticles –thermosensor, which are heated by the laser beam to a temperature of several hundred degrees and burns tumor cells. Various nanoparticles used as thermosensors. The first experiments used nanoparticles of precious metals – silver and gold; they have the so-called Plasmon effect, resulting in a relatively large absorption in the visible region of the spectrum. This absorption spectrum is largely determined by the geometric shape and size of such nanoparticles, and not only by their chemical structure. The most promising were gold nanoparticles, whose absorption was in the region of 600 - 700 nm.

However, such a spectrum cannot be considered true and the absorption is not very high compared to real dyes, whose absorption spectrum is determined mainly by their chemical structure and the form in which the substance is –in the form of nanoparticles or in the form of a true solution.

If the dye is in molecular form, then its molar extinction becomes noticeably higher and the absorption peaks are significantly narrower. In both cases, the molar extinction of the dye will be significantly higher than that of metal nanoparticles, which means that a less powerful laser is required, which will damage healthy tissues less. In this case, the organic dye nanoparticle during laser pulse heating is not just heated; it partially evaporates, resulting in microexplosion –ablation, which damages not only the tumor tissues directly adjacent to the nanoparticle, but also scatters the fragments at some distance from the epicenter. In this case, a molecular form of the dye may be formed, in which the extinction is significantly higher than that of nanoparticles.

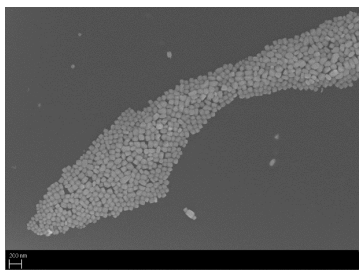


**Рисунок 1.**  
*Zinc Phthalocyanine*

If the dye is a crystalline nanoparticle, the absorption spectrum will be affected by the intermolecular interaction of the dye molecules in the crystal. This usually leads to a decrease in molar extinction. If the dye is in molecular form, then its molar extinction becomes noticeably higher and the absorption peaks are significantly narrower. In both cases, the molar extinction of the dye will be significantly higher than that of metal nanoparticles, which mean that a less powerful laser is required, which will damage healthy tissues less. In this case, the organic dye nanoparticle during laser pulse heating is not just heated; it partially evaporates, resulting in microexplosion –ablation, which damages not only the tumor tissues

This behavior of the nanoparticle gave the name to the method – Pulsed laser ablation of nanoparticles (PLAN). In this case, in the case of zinc phthalocyanine, the molecular form of the dye formed. The extinction of molecular form is significantly higher than that of nanoparticles. Therefore, it used as a photosensor for photodynamic therapy using a continuous laser. In this case, the molecular form of phthalocyanine zinc is only strictly in the tumor zone, which excludes the manifestation of skin phototoxicity.

However, in its strength properties, it is inferior to the widespread copper phthalocyanine (C.I. Pigment Blue 15), so it has not received such a wide distribution. The zinc phthalocyanine can be obtained as most of metal-phthalocyanine condensation of o-phthalodinitrile in the presence of metal salts, in this case zinc acetate in N,N-dimethylformamide, while it is formed as a coarse crystalline powder with a particle size of 300 -500  $\mu\text{m}$ . [1]



**Figure 3.** Image of zinc phthalocyanine dispersion sample obtained on a scanning electron microscope



At the same time, the molecular form of zinc phthalocyanine is a powerful photosensitizer with strong fluorescence, sensitive to continuous laser radiation; under its influence, it generates singlet oxygen and hydrogen peroxide, which depressingly affect the tumor tissues. However, to obtain zinc Phthalocyanine in this form, it is possible only by sublimation of zinc phthalocyanine nanoparticles, for example, by a powerful laser pulse directly in the tumor itself. In this case, the laser pulse causes ablation of the nanoparticle -micro explosion; its fragments destroy the tumor tissue, including the capillaries of its blood system, which causes, at least, inhibition of tumor growth, and more often its degradation[2].

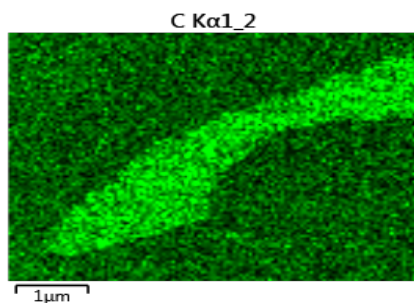
This also occurs partial sublimation of zinc phthalocyanine molecules, and its molecular form adsorbed in tumor tissues in the form of individual molecules. In contrast to the crystalline form, molecular, has fluorescence, by which it could be detected in tumor tissues.

Thus, there is an activation of the inactive drug directly in the tumor itself, after which it becomes possible to use photodynamic therapy methods (PDT) only with respect to the tumor itself, without affecting healthy tissues, since the photosensitizer in the activated form is only in the tumor itself in the minimum required amount.

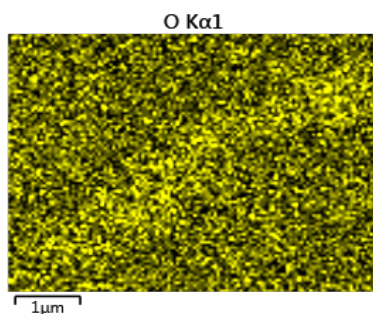
Fig. 2 shows a photograph taken with an electron microscope. The photo shows traces of surfactant (highlighted) used in the dispersion process, from which it was not possible to completely wash the nanoparticles of zinc phthalocyanine. Also in the photo, a number of particles are measured, which allows you to visually assess the degree of dispersion of zinc phthalocyanine, surfactant – Colliphor P407.

Figure 3 shows the image obtained on a scanning electron microscope.

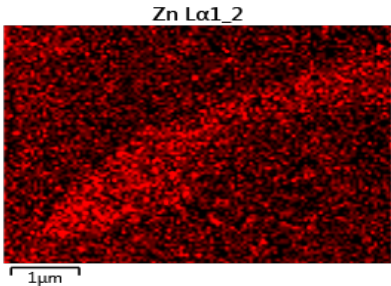
Figures 4-7 show maps of the distribution of elements in the sample – carbon was found in the particles (Fig. 4), oxygen (Fig. 5), nitrogen (Fig. 6) and zinc (Fig. 7), also obtained by scanning electron microscope.



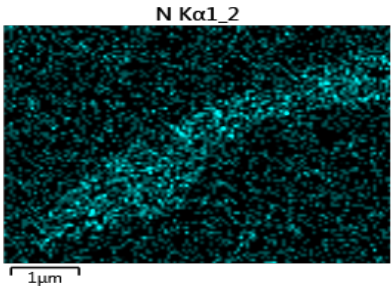
**Figure 4.** Carbon distribution Map



**Figure 5.** Oxygen distribution Map



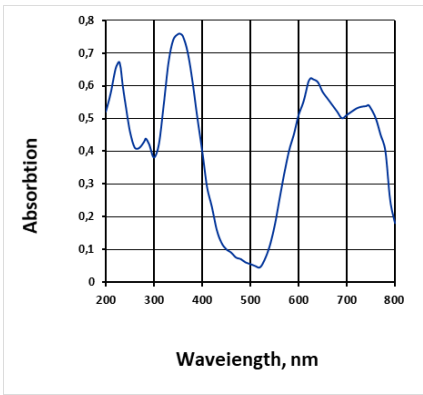
**Figure 6.** Zinc distribution Map



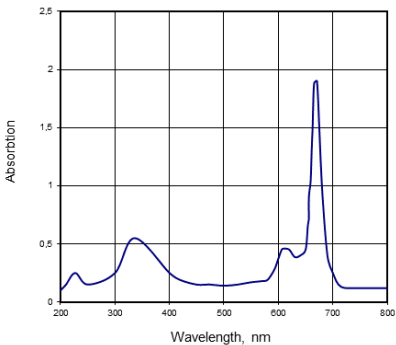
**Figure 7.** Nitrogen distribution Map

The figures show a clear image of the distribution of carbon its content in zinc phthalocyanine is 66, 51% less clear images on maps for nitrogen (19.39%) and zinc (11.31%) and blurred by oxygen present only in the composition of the admixture of diethylene glycol. Carbon, nitrogen and zinc are part of zinc phthalocyanine; oxygen and carbon are part of

The absorption spectra are of the dispersion of zinc phthalocyanine in physiological solution and of a solution of zinc phthalocyanine in N-methylpyrrolidone shown in Fig. 8 and Fig. 9.



**Figure 8.** Absorption spectrum of zinc phthalocyanine dispersion in saline Rice



**Figure 9.** Absorption spectrum of zinc phthalocyanine solution in N-methylpyrrolidone

To base on phthalocyanine zinc drug it in the first place tedious to translate in nano dispersed form. Only in this form, it is possible to obtain a stable drug with a shelf life of several years without changing its properties during storage.

Due to the fact that zinc phthalocyanine is practically insoluble in organic solvents, and with acid pasting in concentrated sulfuric acid, unlike copper phthalocyanine, it is destroyed, forming phthalimide, it was decided to use mechanical methods of dispersion.

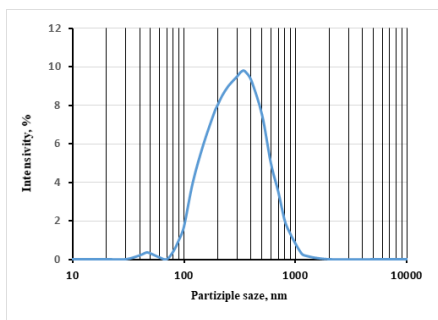
One of these methods is plastic grinding, in which the grinding media is not used ceramic balls or glass beads, and crystal salts with high crystal strength and small particle size.

For this purpose, a two-stage dispersion process consisting of plastic grinding and dispersion by ultrasound used.

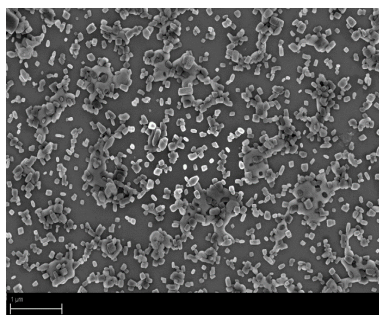
At the first stage, technical zinc phthalocyanine subjected to plastic grinding in the form of a high-viscosity paste in a paddle mixer using fine-grained inorganic salts as grinding media, as well as diethylene glycol as a plasticizer.

After dispersion, the obtained dispersion of zinc phthalocyanine washed with water to remove salts and diethylene glycol. The particle size of this dispersion was in the range from 40 to 1200 nm with a maximum in the region of 300-400 nm for rice 10 shows the particle size distribution and Fig.11 shows an electronic photograph of the nanoparticles of the zinc phthalocyanine obtained after plastic grinding and washing from salts.

It was not possible to wash the plasticizer – diethylene glycol adsorbed on the surface of zinc phthalocyanine nanoparticles, which in the electronic photo also seen, where found in the form of spots merging several zinc phthalocyanine nanoparticles.



*Fig. 10 Particle size Distribution after plastic grinding.*



*Fig. 11 Electronic photo of particles after plastic grinding.*

Then into the water dispersion surface-active substances introduced and re-dispersed by ultrasound in order to destroy the complexes of aggregated nanoparticles and apply a surface-active substance to their surface - same dispersion stabilizer. This approach proved to be very successful and the shelf life of the drug without

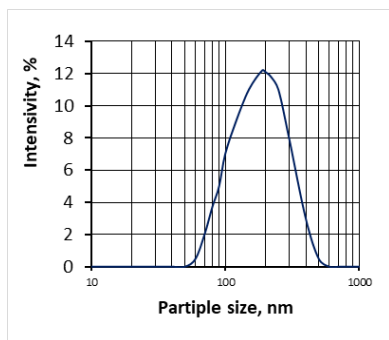
noticeable changes in the dispersed composition has exceeded five years, with the initial shelf life of the drug for two years.

These Dispersion carried out to an average particle size of 100-150 nm. Then dispersion diluted with saline to a given concentration of zinc phthalocyanine.

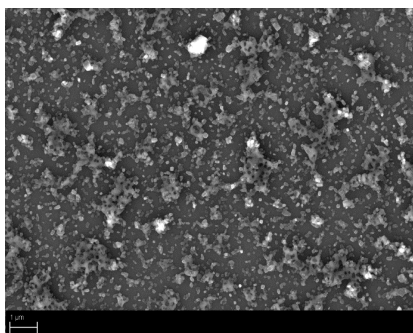
The particle size at all stages of dispersion was controlled by laser scattering (Malvern Autosizer 2S).

Drug Nanosens is a bright blue liquid - stabilized Nano dispersion of zinc phthalocyanine (Fig.1) in saline solution. The active substance content in the preparation is 2 mg/ml. the Average size of zinc phthalocyanine nanoparticles is 150-250 nm [1].

Nanosens is a drug intended for the treatment of skin cancer by an innovative method of Pulsed Laser Ablation of Nanoparticles (PLAN). The essence of the ILAN method is that the nanoparticles of the drug introduced into the tumor are affected by powerful pulsed laser radiation, as a result of which they are locally heated, and their micro-explosive ablation occurs, damaging the tumor tissues, as well as the capillaries feeding it. This leads to inhibition of the



**Figure 12.** Particle size Distribution of the drug Nanosens.



**Figure 13.** Electronic photo of nanoparticles of the drug Nanosens.

tumor, suspension and suppression of its growth, regression, and in some cases to scarring. Thus, ILAN is a non-surgical method of treatment of superficial tumors. Nanosens used for treatment by ILAN combined with photodynamic therapy. In this case, the effects are made sequentially [3, 4].

Results been obtained on the effectiveness, pharmacokinetics and drug Nanosens on animals.

Efficacy studies were conducted on mice with the following grafted tumors: melanoma B-16, lung carcinoma Lewis LLC, sarcoma S-37, carcinoma C-26, Erlich tumor, cervical cancer 5, solid form of leukemia P-388, melanoma B-16.

In all cases, after a single PLAN procedure, there was a inhibition of tumor growth, which may indicate an estimated increase in the life expectancy of the cancer patient and his return to the previous stage of cancer filling. In the case of sarcoma S-37 and lung carcinoma Lewis LLC, there was even a complete cure of some animals: the tumor turned into a scab and fell off.

The dose limit of LD50 of zinc phthalocyanine determined by oral administration of more than 10 g/kg weight. When the drug was tested in therapeutic doses from 7 to 210 mg/kg, no signs of intoxication were observed, although individual organs and tissues at maximum doses acquired a blue color.

It was found that the drug Nanosens does not affect blood clotting and does not have hemolytic activity, and in concentrations less than 0.4 mg/ml, the drug does not irritate with intravenous administration.

In the pathological study of animals subjected to euthanasia on 90 days after administration of the drug, pathological changes in the internal organs and tissues of animals were not revealed.

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提高农业用地生态和经济效益的概念性规定  
**CONCEPTUAL PROVISIONS FOR IMPROVING THE  
ECOLOGICAL AND ECONOMIC EFFICIENCY OF  
AGRICULTURAL LAND USE**

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抽象的。当前农业用地有效利用问题与解决提高土壤肥力、提高农业生产效率、保护土地资源等多项复杂任务相关。累积问题的解决可以是基于农业用地的环境和经济合理利用的建模机制，通过确定使用该类别土地的环境和经济效率，这无疑考虑了对农业土地具有极其负面影响的因素指标。区域划分的总体效率，创建环境可持续的农业集群和农业系统。

关键词：环境和经济效率、建模、要素指标、农业集群、区域划分、可持续和综合发展。

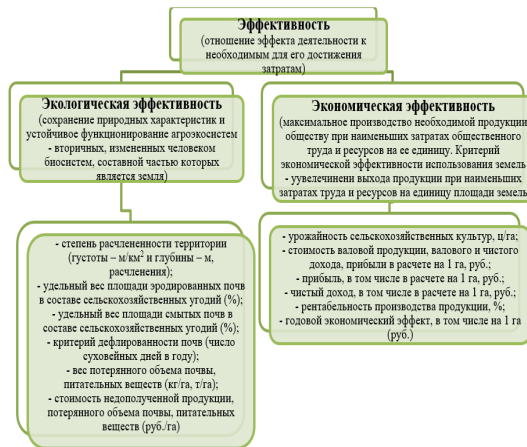
**Abstract.** *The current problems of the effective use of agricultural land are associated with the solution of a complex and a number of tasks aimed at improving soil fertility, increasing the efficiency of agricultural production, and protecting land resources. The solution to the accumulated problems can be a modeling mechanism based on the environmentally and economically justified use of agricultural land by determining the environmental and economic efficiency of using this category of land, which undoubtedly takes into account factor indicators that have an extremely negative impact on the overall efficiency of zoning the territory, the creation of environmentally sustainable agroclusters and agrosystems.*

**Keywords:** *environmental and economic efficiency, modeling, factor indicators, agricultural clusters, zoning of the territory, sustainable and integrated development.*

## Introduction

The process of agricultural development as a fundamental tool for the development of the agricultural economy should carry the maximum result with the minimum expenditure of various kinds of labor that are necessary to obtain it, that is, the agricultural development process should be effective, carry a certain economic and environmental efficiency. [1;2].

The two selected types of efficiency are characterized by cost and natural indicators, for the determination of which it is necessary to first define the types of efficiency, followed by the allocation of indicators for them. The developed algorithm is shown in figure 1.



**Figure 1.** *Cost and physical indicators of economic and environmental efficiency*

Educational literature on the economics and ecology of environmental management does not fully address the issues of environmental efficiency. Today, researchers mention these issues quite often, which is associated with a balanced use, first of all, of agricultural land, which was noted in the UN document “Agenda for the XXI Century”. Achieving a balance of interests of all involved subjects of land relations regarding the use of agricultural land can be achieved through sustainable development, which implies the need to restore and further preserve soil



fertility [3;4]. This aspect is not important for agricultural producers, which, of course, contradicts the regulations and targeted programs approved at the federal or municipal level. The issues of stimulating the investment of various kinds of funds by economic entities in the preservation of the soil cover and its fertility are not raised in due measure, therefore, the contradiction is obvious.

When considering the issues of increasing the efficiency of the use of agricultural land, it is necessary and sufficient to consider interrelated indicators, namely the influence of environmental and economic factors on the use of this category of land in the country's land fund [5;6].

The classification of system indicators, which is used for qualitative and quantitative assessment of environmental and economic efficiency, indirectly depends on the intended use of agricultural land. Let's highlight the key groups of such indicators presented in figure 2.



**Figure 2.** System of indicators of environmental and economic efficiency of agricultural land use

In addition to Figure 2, we note that the indicators displayed on it are dynamic indicators that can change or be supplemented by the type of land use, habitat, conditions, and so on. Noting the system of indicators of environmental and economic efficiency of agricultural land use, let's say about the theoretical and methodological study of some authors in questions of recommendations for assessing the effectiveness of such lands.

### Purpose of the study

It should be noted that increasing the efficiency of the ecological and economic nature is the primary requirement for the social development of a particular region or subject. There is a principle according to which the development of society is deter-



mined by the development of technology, and as a result, the environmental and economic efficiency of the use of agricultural land increases. Benefits for consumers and producers will improve with efficiency improvement processes. However, multiplying such efficiency must be balanced with environmental and social performance in the short and long term.

An independent assessment of the environmental and economic component of the efficiency of all types of land use is a very important task that allows all regions of the country to determine a certain production plan for farming on their territory with the maximization of profit from its use and the simultaneous process of reducing the risks of land degradation within the regions.

### **Materials and methods**

The provisions for improving the environmental and economic efficiency of the use of agricultural land were analyzed

### **Results and discussion**

The main task of any state and society in terms of increasing the considered type of efficiency of a special category of land - agricultural land is to increase the interest of companies and relevant organizations in the introduction of the latest agricultural technologies on their territory, aimed at an environmentally-oriented component of growth. Data for 2021 determine the percentage of new developments introduced into Russian agriculture at 3% [7;8]. Over the same period of time in other countries, such as the USA and Australia, this figure almost doubled and amounted to 2.3% and 4.5%, respectively [9;10].

To create agriculture in the aspect of its intellectual development, it is necessary and sufficient to use and introduce automation and digitalization systems into production, use unmanned aerial vehicles to survey vast areas in order to monitor land in real time, as well as for spot farming. In addition, it is necessary to use robotics in order to replace human labor with robotic automatic means.

Today, large agricultural holdings are successfully operating on the territory of the Russian Federation, already using the technologies of the future in their production. These include such agricultural enterprises as Miratorg, Agrocomplex, Prodimex, RusaAgro, Volgo-Don Invest, Eco-Niva, Avangard-Agro and etc.

Nevertheless, in order to increase the interest of the agricultural producer, the state should control the activities of such enterprises through regulation, applying incentive measures that are related to compliance with legislation, primarily environmental, with the protection and restoration of such lands, and so on. These actions require a balanced and integrated system of measures,

which include, for example, the development of a system of actions aimed at the process of providing subsidies and preferences in agricultural production and their justification. It can also be negative actions on the part of the state, such as the imposition of fines for the irrational use of agricultural land and their withdrawal

from circulation. In this case, sanctions for such use of land can be calculated using formula (1).

$$\Delta ZL - I_L \times S_K - H > I_P \times S_K - \Delta ZP), \quad (1)$$

where  $\Delta ZL$  – additional types of costs for the restoration of disturbed soils;

$I_L$  – the volume of investments invested in the restoration of soil productivity;

$S_K$  – capitalization rate;

$H$  – definite fine;

$I_P$  – investment component in improving the properties of the land;

$\Delta ZP$  – additional costs every year.

Thus, by linking the above two components, it is possible to obtain real-time components of the environmental and economic efficiency of agricultural land, each of which is identified by a group of indicators that separately reflect economic and environmental efficiency, respectively.

For a more visual display of indicators that fully determine economic efficiency, in table 2 we will reflect their methods of determination and the corresponding formulas, with the help of which these indicators can be calculated.

In addition, an important indicator in assessing the effectiveness of the ecological environment is the index of impact on such land use environments, namely the calculation of this index in quantitative terms. For example, the amount of crop protection products used per hectare of arable land, or the amount of all fertilizers applied, and so on.

**Table 2**  
*A group of indicators reflecting the economic efficiency of the use of agricultural land*

Indicator	Definition	Formula and its notation
gross harvest of agricultural crops	the amount of gross crop yields in agricultural organizations and households	gross harvest \u003d Productivity * sown area
production volume (GO)	the total value of goods and services produced in a given period	$GO = \sum_{i=1}^n Q_i \times P_i$ , $Q_i$ – the volume of products of the i-th type; $P_i$ – the price of products of the i-th type.

intermediate costs (IC)	the entire cost of materials and services used in the production process	$IC = \sum_j^m C_j$ , $C_j$ – j-type costs in production
added value (VA)	the physical quantity of products and services produced in industry in a year or cycle	$VA = GO - IC$
mixed income (MI)	net income of producers, including labor income and profit per unit area	$MI = GO - IC - (A + T + \text{hired labor})$ , A- depreciation of fixed assets; T- taxes and taxation
value-for-value performance ( $T_{GO}$ )	ratio of output value per unit area on economically intermediate products in a cycle	$T_{GO} = GO / IC$ (times)
value added rate ( $T_{VA}$ )	the ratio of value added on average per unit area with intermediate costs in the cycle	$T_{VA} = \frac{VA}{IC}$ (times)
mixed rate of return on intermediate costs ( $T_{MI}$ )	falls on average per unit area of intermediate costs in the production cycle in relation to mixed income	$T_{VA} = \frac{MI}{IC}$ (times)

### Conclusion

In Russia, for a long period of time, a lot of research has been carried out to determine either the economic or environmental efficiency of agricultural land use. We have put forward the task of jointly calculating and evaluating the effectiveness of an environmental and economic indicator, in which the economic effect will be defined as the amount of income that falls on the difference in the areas of land used, and the environmental effect will be a decrease in loss of land fertility.

In figure 3, we present a conceptual model of a system of measures aimed at improving the efficiency of the use of agricultural land, in conjunction with three aspects: social, legal and environmental-economic.



**Figure 3.** Conceptual model of a system of measures aimed at improving the environmental and economic efficiency of agricultural land use

Summarizing the above, it is possible to note that the implementation of such activities as the rational allocation of agricultural land, the use of the principles of biologization when placing such land, increasing the area of natural ecosystems through the creation of reserves, wildlife sanctuaries, national parks, the absence of the use of pesticides, an increase in the share of bare fallows in crop rotations and more - increase the use of agricultural land at times.

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蔬菜作物滴灌垂直栽培营养液投配技术及系统  
**TECHNOLOGY AND SYSTEM OF FEEDING AND DISTRIBUTION  
OF NUTRIENT SOLUTIONS FOR VERTICAL CULTIVATION OF  
VEGETABLE CROPS ON DRIP IRRIGATION**

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抽象的。 本文讨论了计算垂直滴灌系统的方法,该方法允许在使用各种滴管设计时选择最佳参数。 建议的灌溉系统可用于滴灌蔬菜作物的垂直种植,特别是在垂直农场中。

关键词: 滴灌, 管道, 滴管。

**Abstract.** *The article discusses the methodology for calculating vertical drip irrigation systems, which allows selecting their optimal parameters when using various designs of droppers. The proposed irrigation systems can be used for vertical cultivation of vegetable crops on drip irrigation, in particular in vertical farms.*

**Keywords:** *drip irrigation, pipelines, droppers.*

**Introduction.** The intensification of agricultural production and the increase in crop yields at the present stage of the development of science poses increasingly complex tasks for scientists to develop modern irrigation systems and improve methods for their calculation. Particular attention should be paid to the creation of resource-saving technical means and the introduction of resource-saving, environmentally friendly technologies.

Currently, drip irrigation systems are widely used all over the world, providing significant savings in water, energy and labor resources. The traditional method of vegetable growing using drip irrigation involves growing crops in the fields. To-

day, new vertical systems for growing crops indoors using such irrigation systems as drip irrigation, hydroponics, aeroponics, etc. have appeared [1].

Modern vertical farms have a number of advantages. These include:

- compactness of the equipment: the leased land will completely replace the small areas of basements, attics or storage facilities;
- reduction of labor, material and financial costs: automation of equipment allows to reduce the number of service personnel and the cost of agricultural machinery;
- not dependent on climate and weather conditions;
- ease of maintenance, etc.

The principle of vertical gardening has ceased to be used only for growing decorative indoor plants, but has been used to save space, reduce material costs when growing greens, vegetables and berries, as well as to obtain environmentally friendly products.

The device of such vertical farms most of all resembles multi-tiered greenhouses: several levels of the landing surface are placed one above the other.

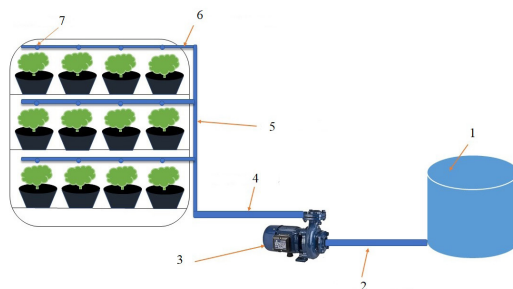
Vertical farms allow you to harvest a large crop from a minimum space. In addition, the main processes of the system functioning are automated, which means that they do not require constant human participation: labor costs are also minimal.

The main task of such systems is to provide high-quality lighting for each of the levels, as well as to properly organize the principle of feeding and watering plants.

**The purpose of the study** is to develop theoretical foundations and scientifically based methods of drip irrigation systems for vertical cultivation of crops.

#### **Research methodology.**

The installation for determining the parameters of the liquid flow during vertical drip irrigation is shown in fig. 1.



**Figure 1.** Installation for determining the parameters of the liquid flow during vertical drip irrigation: 1 - tank, 2 - inlet pipe, 3 - pump, 4 - main pipe, 5 - middle pipe, 6 - irrigation pipe, 7 - droppers.

To calculate the pressure loss due to friction in the case of a constant flow, we use the Hazen –Williams equation [2]:

$$hf = \frac{KL \left(\frac{Q}{c}\right)^{1.852}}{D^{4.87}}, \quad (1)$$

where: hf= friction pressure loss in case of constant flow, m; D - pipe inner diameter, mm; K - constant equal to  $1.22 \cdot 10^{10}$ ; L - pipe length, m; Q – consumption, l/s; C - the Hazen-Williams coefficient is determined by the type of material from which the pipe is made.

The presence of droppers will be taken into account by the reduction factor F [3]:

$$hfe = Fhf, \quad (2)$$

$$F = \frac{1}{m+1} + \frac{1}{2N} + \frac{(m-1)^{0.5}}{6N^2}, \quad (3)$$

where N - the number of drippers on the irrigation pipe.

Let's determine the values for watering a plot of one square meter, set at a height of 3 m.

Condition for choosing the inner diameter of the irrigation pipe, mm

$$D \geq \left[ \frac{FKL \left(\frac{Q}{c}\right)^{1.852}}{0.55h_{fall}} \right]^{\frac{1}{4.87}}, \quad (4)$$

where:  $h_{fall}$  - allowable total head loss, m

Required pressure at the beginning of the irrigation pipe, m [4]:

$$Hm = ha + 0,75(h_{fe} \pm \Delta Z) + hr, \quad (5)$$

where  $ha$  - operating head of the dropper, m;  $h_{fe}$  - actual total pressure loss on the irrigation pipe, m;  $\Delta Z$  - height difference between the beginning and end of the irrigation pipe, m;  $hr$  - dropper height, m

(+ in case of irrigation pipe “up”)

(- in case of irrigation pipe “down”)

Similarly, we will carry out calculations for the middle, main and inlet pipes.

We select the pump from the condition: the flow rate of the pump is equal to the flow rate of all droppers operating simultaneously, and 10% is added to the



flow rate as a safety measure.

Required pressure:

$$H_{DH} = h_{sm} + 1.1h_{fm} + \Delta z + h_{fs} + h_{head}, \quad (6)$$

where  $h_{sm}$  - required head at the beginning of the middle pipe, m;  $\Delta z$  - height difference between the water levels and the beginning of the middle pipe, m;  $h_{fm}$  - actual total pressure loss on the main pipe, m;  $h_{fs}$  - actual total pressure loss on the inlet pipe, m;  $h_{head}$  - head loss in the filter and fertilizer device, m

### Research results.

For example, consider the option of planting lettuce on an area of 1 square meter at a height of 3m. Based on the required amount of water, it is necessary to install droppers with a flow rate of 1 l / h. Distance between droppers 20 cm. Thus 4 droppers in a row, three rows located one below the other. The total number is 12 pieces per 1 square meter.

As a result of the research, a piping system and a pump were selected.

Irrigation pipe:

material – PVC, inner diameter 4mm, outer diameter 7mm.

Middle pipe:

material – PVC, inner diameter 10 mm, outer diameter 14 mm.

Main and intake pipe:

material – PVC, inner diameter 14 mm, outer diameter 18 mm.

Characteristics of the required pump:

Productivity not less than 0,2 l/s.

The maximum head is -0.25MPa.

Similarly, you can calculate the equipment for the required vertical planting area.

### Conclusion.

The developed method for calculating vertical drip irrigation systems allows you to select the optimal system parameters for vertical cultivation of vegetable crops, in particular for vertical farms.

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带“智能模块”的大范围洒水机  
**WIDE-REACH SPRINKLER MACHINE WITH “INTELLIGENT  
MODULE”**

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抽象的。本文讨论了通过对控制系统进行现代化改造来改进宽幅喷灌机的可能性。安装的“智能模块”通过将信息传输到操作员控制台、随后进行数据处理和分析来控制喷水器的操作。它基于可编程逻辑控制器制造，可让您通过引入必要的肥料、控制用水量和其他参数来确保及时灌溉。提供了向洒水车操作员的手机发送短信通知的可能性。安装的“智能模块”允许您根据从传感器和气象站接收的数据，根据田间水分储备水平实时更改灌溉率。

关键词：广覆盖洒水喷头，洒水，控制与管理，自动化，“智能模块”，资源节约技术。

**Abstract.** *The article discusses the possibility of improving wide-sprinkling machines by modernizing the control system. The installed “Intelligent Module” provides control of the operation of the sprinkler with the transfer of information to the operator’s console, followed by data processing and analysis. Made on the basis of a programmable logic controller, it allows you to ensure timely irrigation with the introduction of the necessary fertilizers, control water consumption and other parameters. The possibility of SMS notification to the mobile phone of the sprinkler operator is provided. The installed “Intelligent Module” allows you to change the irrigation rate in accordance with the level of moisture reserves of the field sections in real time, based on data received from sensors and a weather station.*

**Keywords:** *wide coverage sprinkler, sprinkling, control and management, automation, “Intelligent Module”, resource-saving technologies.*

**Introduction.** Ensuring food security in the modern world is the most important task of the development of agriculture. According to existing forecasts [1], food production should increase by 70-100 percent by 2050 in order to meet the needs of the nine billion people of the planet.

It is necessary to look for opportunities to increase crop yields, more efficient use of agricultural machinery, and reduce costs for production, fertilizers, water and electricity.

Improving the quality of irrigation can be achieved by changing the irrigation rate in accordance with the level of moisture reserves of the field sections in real time, adapting the irrigation regime to changing conditions during the irrigation period [2-4].

**The purpose of the study** is to improve the sprinkler control system, expand its technological capabilities, and reduce the environmental load by introducing energy-saving environmentally safe irrigation technology.

#### **Research methodology.**

The irrigated area of the field is divided by sectors into several sections. The number of plots is determined by the number of crops with different required irrigation rates, relief features, or soil plots with different characteristics.

That is, it is necessary to allocate sections of the field in the form of sectors, the entire area of which should be irrigated with the same rate.

In the case of a fairly even relief, one crop and soil type, to ensure the quality and uniformity of irrigation, to ensure the irrigation rate in accordance with the level of moisture reserves of the field sections at the time of their irrigation in automatic mode, it is enough to divide the plot into 4 sectors.

Information from humidity sensors installed on four sectors of the irrigation area along the radius of each sector in 35-40 m and weather stations via the GLONASS satellite goes to the GLONASS receiver and then to the signal analyzer unit in the Intelligent Module, after which the irrigation rate is adjusted according to formula 1, giving the command to start watering the irrigated sector.

Irrigation rate on the  $i$ -th plot,  $\text{m}^3/\text{ha}$ :

$$M_i = 2\pi \frac{1200 Q_M}{\ell_{\text{CEK}} V_{\text{CP}}(\varphi)} \left[ 1 - \frac{1}{(1 + 10 E \xi \ell_{\text{CEK}})^{n+1-i}} \right] \quad (1)$$

$$\text{Where } \xi = \frac{s}{432 \cdot 10^3 K_{\text{CYT}} Q_M},$$

$Q_M$  – machine consumption,  $\text{l/s}$ ;

$\ell_{\text{SEC}}$  – the path passing by the last cart, i.e. sector arc length,  $\text{m}$ ;

$V_{\text{AV}}$  – the average speed of the trolley depending on the angular coordinate  $\varphi$ ,  $\text{m/s}$ ;

E – intensity of water consumption, mm/day;  
 i – lot number from the beginning of the field,  $i=1,2,\dots,n$ ;  
 n – total number of plots;  
 s – path passing by the last cart;  
 $K_{DAY}$  – time factor.

Correction of the irrigation rate allows you to coordinate the irrigation rate with the level of moisture reserves of the field areas at the time of their irrigation, change the irrigation rate when irrigating several different agricultural crops sown by sectors in automatic mode by the machine, ensures uniform irrigation and irrigation quality in areas with difficult terrain, slopes, different types of soils.

The novelty is confirmed by RF patents: 2755688 and 2755996.

Research results.

The developed control system was implemented on the “KASKAD” wide-sprinkler sprinkling machine, on irrigated fields in the UNPO “Povolzhye” (Stepnoye village, Engelssky district of the Saratov region), fig.1.

Main technical characteristics:

Irrigated area - 80.4 ha.

Water consumption - 62 l/s.

The working pressure at the inlet to the machine is 0.4 MPa.

The length of the irrigation complex is 480.7 m.

The minimum duration of a complete revolution is 20.7 hours.

Irrigation rate per rotation can vary - from 60 to 664 m<sup>3</sup>/ha.



**Figure 1.** Irrigation machine KASKAD

The control system provides control of the functional state of the sprinkling machine with the transfer of the collected information to the operator's console,

subsequent processing, analysis and archiving of the received data. Based on a programmable logic controller, OWENLogic makes it possible to ensure timely watering of irrigated areas with the application of the necessary fertilizers, according to a given algorithm, to control water consumption and other parameters.

The irrigation complex includes:

- wide-sprinkling sprinkling machine of circular action;
- control system with “Intelligent Module”;
- pumping station control module;
- operator console;
- weather station for monitoring and forecasting weather conditions;
- wireless autonomous sensors for monitoring irrigation parameters.

To control the movement on the intermediate self-propelled support carts of the wide-sprinkler sprinkler, devices for synchronizing carts in line (DSL) are installed, which generate commands for the movement of carts.

On the leading self-propelled support cart, a heading stabilization device (HSD) is installed, which generates a command for the movement of the leading self-propelled support cart, which sets the speed of movement of the entire sprinkler machine in the area around the fixed support.

A control panel is installed on a fixed support, in which protective equipment and a control panel are located, in which are located: “Intelligent Module”, an electric energy meter and a timer.

A map of the controlled area is displayed on the computer monitor, indicating the location of the sprinkler and its functional state.

It is possible to set up SMS alerts on mobile phones of service personnel.

“Intelligent Module” provides monitoring of the soil condition, analyzes the received data, changes the irrigation rate depending on the micro-roughness of the site and weather data in real time without direct human intervention.

The main task of the “Intelligent Module” is to assess the main factors that determine the need to make adjustments to the irrigation regime, analyze the information and make a decision on the quantitative change in the irrigation rate.

Operational planning of operational irrigation regimes using mathematical models and digital technology can improve the accuracy of the required volumes of water supply, ensuring efficiency and saving water and energy resources.

**Conclusion.** The Russian market of digital technologies in agriculture is not sufficiently developed, it is distinguished by a small choice, limited opportunities and requires an integrated scientific and practical approach.

The developed and implemented control system for wide coverage sprinkling machines with “Intelligent Module” allows you to significantly expand the technological capabilities, provides resource-saving and high-quality irrigation.

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系统分析方法在解决现代凝汽式火电厂环境问题中的应用

## APPLICATION OF SYSTEM ANALYSIS METHODS TO SOLVING THE ENVIRONMENTAL PROBLEMS OF MODERN CONDENSING THERMAL POWER PLANTS

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抽象的。 本文致力于从系统一般理论的角度研究凝汽式火力发电厂(TPP)的环境问题。 考虑了 Novocherkasskaya SDPP 水处理系统的分阶段现代化改造。 介绍了使用技术标准和IDEF0功能建模标准制作的现代化前后水处理系统的流程图。 显示了IDEF0标准应用在初始设计阶段的效率。 使用 Saaty 层次法对水处理系统的优先现代化项目进行多标准选择。 显示了现在实施的以环境因素为高度优先的完整现代化项目的最优性。 改善环境绩效可提高 TPP 作为系统对象的可持续性。

关键词: 凝汽式火力发电厂, 水制备, 生态, 系统分析。

**Abstract.** *The article is devoted to the study of environmental problems of condensing thermal power plants (TPP) from the standpoint of the general theory of systems. The stage-by-stage modernization of the Novocherkasskaya SDPP water treatment system is considered. The flow diagrams of the water treatment system before and after the modernization, made using technical standards and the IDEF0 functional modeling standard, are presented. The efficiency of the IDEF0 standard application at the initial design stage is shown. The multicriteria selection of the priority modernization project for the water treatment system was carried out, using the Saaty hierarchy process. The optimality of the complete modernization project implemented now with a high priority of the environmental factor is shown. Improving environmental performance increases the sustainability of TPPs as a system object.*



**Keywords:** *Condensing thermal power plants, water preparation, ecology, system analysis.*

## 1 Introduction

Condensing thermal power plants (TPP) are complex technical dynamic systems from the standpoint of the general theory of systems. Their structure and functioning are subjects to system-wide principles, which are manifested taking into account the specifics of TPP: monocentrism, limiting factor, ontological continuity, feedback and others. One of the important structural elements of condensing thermal power plants is a water purification system. The discrepancy between the parameters of the make-up water and the regulatory requirements is a limiting factor of solving the main task of TPP – electricity generation. At the same time, water purification leads to the production and accumulation of waste requiring disposal: sludge from water treatment plants, used ion-exchange resins and other materials. Waste accumulation worsens the environmental performance of TPPs. Environmental requirements are imposed on the operation of a thermal power plant both in terms of the level of environmental impact and in terms of the working conditions of personnel. This is a manifestation of the ontological continuity of TPP as an object inscribed in the external environment and possessing an internal structure and properties. Environmental performance management of TPPs is a manifestation of the systemic feedback principle. Neglecting the environmental aspect and accumulating environmental problems can become another limiting factor of the operation of TPPs.

## 2. Modernization of Novocherkasskaya SDPP the water treatment system

Significant step-by-step transformations of the Novocherkasskaya SDPP water treatment facility technological scheme began in 2004 [1-3]. The reverse osmosis unit was introduced to replace the classical technology of three-stage H-OH-ionization at the first stage of the WTF modernization. The unit has a capacity of up to 150 m<sup>3</sup>/h and includes three parallel operating units, each of which is represented by a microfiltration filter, a working pump and a membrane module with membrane elements FILMTEC BW 30-400 manufactured by Dow Chemical, USA. The selectivity of these membranes is at least 99% for a model 0.15% sodium chloride solution. Reverse osmosis facilities are fully automated and have two-stage on concentration. Ion-exchange desalting remained only as the final stage of desalting, providing the required degree of additional water demineralization when a sharp decrease in the consumption of highly aggressive reagents used at the stage of regeneration of ion-exchange materials. The quality of the demineralized water has generally improved, which can be illustrated by the data on the residual concentrations of silicic acid anions.

The second stage of water treatment facility modernization affected the stage of preliminary treatment. Reagent water clarification was replaced by ultrafiltration technology, which significantly reduced the consumption of reagents (milk of lime and coagulants), increased the quality of water clarification, even during the flood period, and, in general, increased the facility environmental performance.

At the third stage of modernization the deep desalination by the method of H-OH-ionization with the use of strongly basic anion-exchange resins was successfully replaced by the technology of water electrodeionization, which allows to reduce the consumption of reagents even more, but imposes increased requirements on the quality of preliminary water treatment.

The technological scheme of water treatment before modernization allows to ensure the quality of water treatment that fully complies with the requirements for additional water of supercritical units. However, during the regeneration of cation-exchange and anion-exchange resins, waste regeneration wastewater is formed, which is discharged into the neutralizing tank. The sludge is formed that requires dehydration and disposal when they are neutralized. The station had acid and alkaline facilities for the preparation of the regeneration solutions themselves. The presence of large volumes of toxic highly aggressive waste water reduces the water treatment facility environmental performance as a whole.

Acid, alkaline, lime and coagulant facilities are absent in the water treatment facility technological scheme after the third stage of modernization completion and introduction of the deep water demineralization by the method of electrodeionization. Initial water is mechanically filtered on coarse and fine filters, and then it is supplied to the ultrafiltration unit. Further, the water prepared in this way is supplied for desalination by methods of reverse osmosis and electrodeionization. The reverse osmosis unit is a two-stage filtrate and two-stage concentrate. This scheme allows you to minimize the volume of waste water from the reverse osmosis facility, but the degree of water desalination does not meet the requirements for the quality of the additional water of supercritical units. Therefore, the permeate of the reverse osmosis unit is fed for further desalination by the method of electrodeionization, which combines the technologies of reverse osmosis and ion exchange.

Stages of modernization of the water treatment system at Novochoerkasskaya SDPP for the period 2004-2015 can be represented as a sequential transition from project 1 to project 2, then to project 3, then to project 4. The initial state of the water treatment system was corresponded to project 1, the details of which in the IDEF0 standard are shown in Fig. 1. Additional water goes through the stages of preliminary treatment, primary desalting and deep desalting. At the first modernization stage, the primary desalination was replaced with the introduction of a reverse osmosis unit, which corresponds to the transition to project 2. This stage

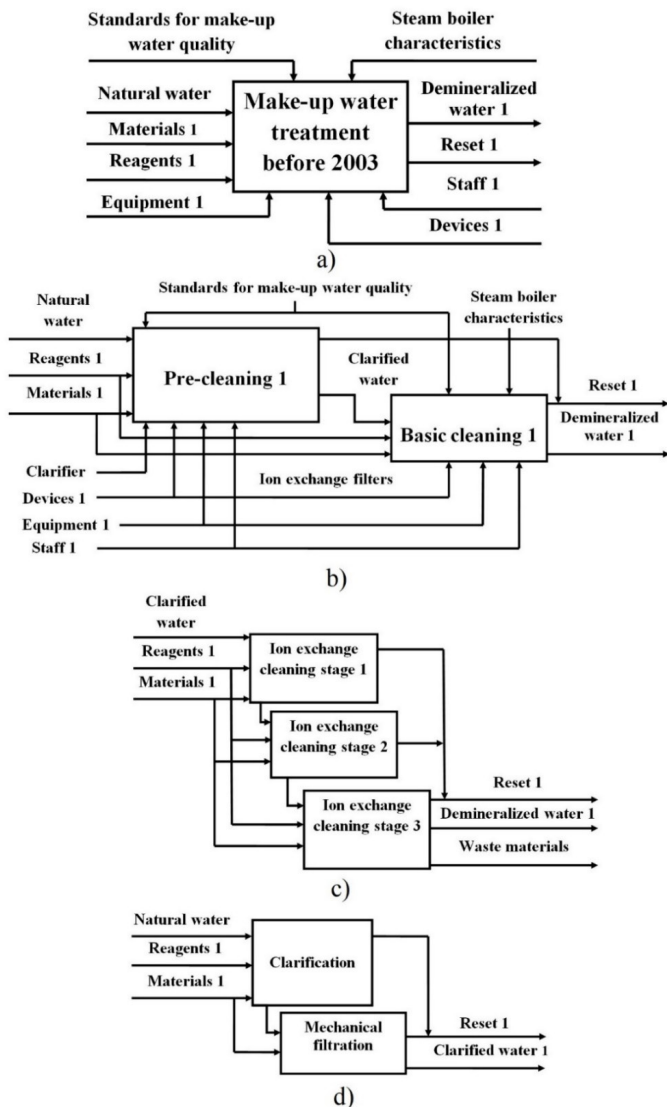
was the most labor-intensive and expensive. A fundamentally new purification scheme was implemented, which made it possible to completely abandon hazardous acid-base reagents. The technical indicators were improved significantly. At the second stage of modernization, the preliminary treatment subsystem was replaced and the transition to the implementation of project 3 was made. At the third stage of modernization, deep desalination was replaced with the introduction of an electrodeionization unit, which made it possible to completely eliminate discharges of harmful substances. Today, the water treatment system at Novocherkasskaya SDPP corresponds to project 4.

### **3. Selection of the optimal project for the modernization of Novocherkasskaya SDPP water treatment system using the Saaty hierarchy process**

The modernization of the water treatment system at Novocherkasskaya SDPP took more than 10 years and required significant investments. To what extent were these costs justified? Perhaps you should have stopped at 2 or 3 projects? The systems analysis methods, in particular, the Saaty hierarchy process, are successfully used in the problems of optimal strategy choosing [4-11].

We will conduct a comprehensive assessment of all projects based on a combination of technological, environmental, financial and social indicators.

The parameters of the aforementioned technological schemes of the water treatment system are given in the table. 1. The criteria for comparing the considered technological schemes in terms of their importance can be estimated according to the table. 2: the more significant a criterion is, the higher its score is.



**Figure 1.** Technological diagram of the Novocherkasskaya SDPP water treatment system as on 2004: context diagram (A) and its detailing (B – context diagram decomposition, C – preliminary treatment stage decomposition, D – main treatment stage decomposition) in the IDEF0 standard

The comprehensive assessment of the projects 1-4 (A1-A4 respectively) effectiveness was carried out using the Saaty analytic hierarchy process. The problem model is shown in Fig. 3. The goal of each of the stages and the modernization in general was to improve the efficiency of the make-up water treatment system at TPPs.

**Table 1**

*Comparative characteristics of technological schemes for Novoherkasskaya SDPP water treatment before and after reconstruction*

Indicators	Initial technological scheme	Final technological scheme
Waste water from the clarifier, m <sup>3</sup>	1080	is absent
Waste water of the neutralizing tank, m <sup>3</sup>	450	is absent
Spent regeneration solutions of cation-exchange filters, m <sup>3</sup>	180	is absent
Spent regeneration solutions anion-exchange filters, m <sup>3</sup>	110	is absent
Limefacity	there is	is absent
Coagulantfacity	there is	there is
Acidfacity	there is	is absent
Alkalinefacity	there is	is absent
Water consumption for auxiliary needs of the water treatment plant,%	4,5%	3,7
Electricityconsumption	average	high
Cost of consumables per m <sup>3</sup> of demineralized water	average	high
Staffqualificationrequirements	average	high

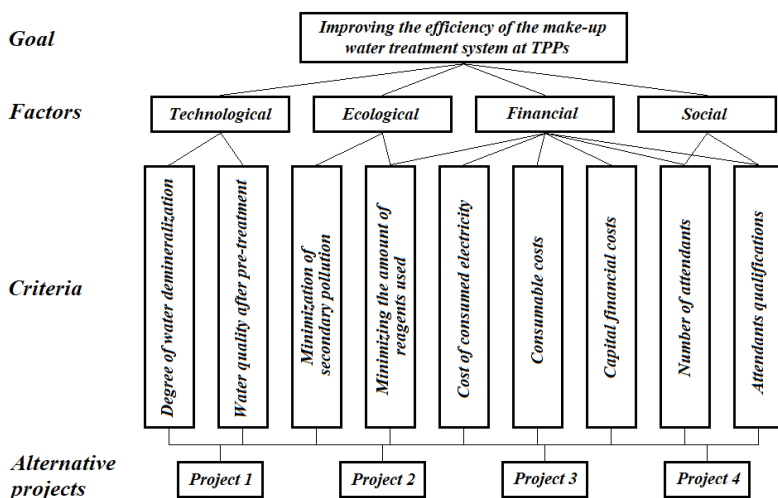
**Table 2**

*The significance of the criteria for comparing the considered technological schemes*

Criteria for comparing the water treatment technological schemes	Factors	Points
Degreeofwaterdemineralization	Technological	9
Water quality after pre-treatment	Technological	9
Minimizationofsecondarypollution	Ecological	7
Minimizing the amount of reagents used	FinancialandEcological	7
Costofconsumedelectricity	Financial	6
Consumablescost	Financial	5
Capitalfinancecosts	Financial	5
Numberofattendants	SocialandFinancial	4
Attendantsqualifications	SocialandFinancial	4

The considered hierarchy is four-level incomplete. As it can be seen from Table 2, all characteristics (criteria) refer to 4 factors, as can be seen from Table 2. The significance of the factors in points according to the goal of modernization was assessed as follows: environmental – 9, technological – 7, financial – 5, social – 3. The higher the indicator is, the greater the significance of the factor is.

Some criteria are considered only from the position of one factor, some – from the position of 2 factors. Moreover, minimization of the amount of initial reagents is beneficial both in financial and environmental points, and the number and qualifications of service personnel are manifested in different ways from the standpoint of social and financial factors.



**Figure 2.** Hierarchical model of the problem of increasing the efficiency of the make-up water treatment system at TPPs

A preliminary scoring of projects was carried out according to the criteria in order to build matrices of paired comparisons. With the consistent implementation of A1-A2-A3-A4 projects, capital costs increase in the ratio of 3-6-7-9, electricity costs increase in the ratio of 1-3-4-6, more consumables are required in the ratio of 2-5-6-7, less reagents are required in the ratio of 9-6-4-1, the volume of secondary pollution decreases in the ratio of 9-5-3-1, the quality of preliminary water purification improves in the ratio of 1-1-4-4, the quality (degree) of desalination improves in ratio of 1-1-2-2, less personnel is required in the ratio of 6-4-3-2, while the requirements for their qualifications increase in the ratio of 1-5-7-9. The results of calculating global project priorities are showed in the Table 3

**Table 3**  
*Priority assessment of projects to modernize the make-up  
 water treatment system at Novocherkasskaya SDPP*

Projects	Factors and priorities				Final assessment of project priorities
	Ecological	Technological	Financial	Social	
	0,52	0,29	0,12	0,07	
A1	0,04	0,14	0,29	0,36	0,12
A2	0,17	0,14	0,21	0,23	0,17
A3	0,30	0,36	0,22	0,20	0,30
A4	0,49	0,36	0,28	0,21	0,41

The most priority was the A4 project (Fig. 2) – the current state of the water treatment system at the Novocherkasskaya SDPP, as it can be seen from Table. 3. The A3 project is on the second place in priority, without the introduction of a modern deep desalination unit. The initial state of the water treatment system, project A1 (the so-called «zero option» – without modernization), is the least priority. However, if we consider the priority of projects by individual factors, then the A4 project is in the lead in environmental and technological aspects, and A1 is in the lead in financial and social aspects (do not spend money and save more jobs). Thus, if the priority of factors for the DM (decision-maker) changes (according to our research – in a very narrow range of values), it can be possible that project A1 will become the most priority, and project A4 will take second place. This is a general principle [11] of assessing the effectiveness of projects for the modernization of technical systems: if the «zero option» is introduced into consideration and the economic (financial) criterion is given high importance, then the «zero option» – the absence of modernization – becomes the most priority project. In such cases, we recommend paying attention to the second priority project (in our case, this is the A4 project). In general, in this case, the leading position of the A4 project is stable in a wide range of priority factors, which makes it possible to recommend it for implementation at other condensing TPPs.

#### 4. Conclusions

The system analysis and functional modeling methods are effective tools for assessing, planning and describing the modernization of technical objects, especially when it is necessary to select a priority direction and coordinate the actions of various profiles specialists – engineers, ecologists, financiers, lawyers. According to the experience of the Novocherkasskaya SDPP and the analysis carried out in this article, it is possible to recommend the phased introduction of reverse osmosis, ultrafiltration and electrodeionization of water into the water treatment systems of condensing thermal power plants. Assessing the priority of projects,

using the Saaty method of Analytic Hierarchy Process, allows you to compare financial and labor costs with the resulting technical, economic, environmental benefits. The IDEF0 standard makes it possible to show the process of modernizing the water treatment system of a TPP in a simplified form. With the technical modernization of TPPs, the introduction of systems analysis methods allows you to choose projects for implementation that are most effective in terms of a diverse factors combination. Improving environmental performance increases the sustainability of TPPs as a system object.

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水溶液的机械和电磁活化  
**MECHANICAL AND ELECTROMAGNETIC ACTIVATION OF  
AQUEOUS SOLUTIONS**

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抽象的。工作目的：分析机械活化和微波照射对水表面性质的影响。已经确定机械和电磁效应都会改变水和水溶液的表面能。但他们的影响是模棱两可的。搅拌机械活化过程中的表面张力，对于不同的溶液，在不同的时间间隔内降低到一定的最小值，然后升高到一定的水平。存在杂质对表面张力的显着影响的趋势。溶液越复杂，杂质浓度越高，其表面能越低。根据工艺研究的结果，例如揉面，建议使用机械加工（混合）溶液进行揉面 60-70 秒或微波处理不超过 20 秒。

关键词：机械活化，混合，微波作用，水，水溶液，表面张力。

**Abstract.** *Purpose of the work: analysis of the influence of mechanical activation and microwave exposure on the surface properties of water. It has been established that both mechanical and electromagnetic effects change the surface energy of water and aqueous solutions. But their influence is ambiguous. Surface tension during mechanical activation by stirring decreases to a certain minimum for different time intervals for different solutions, and then increases to a certain level. There is a tendency for a noticeable effect of impurities on the surface tension. The more complex the solution and the higher the concentration*

*of impurities, the lower its surface energy. According to the results of research for technological purposes, for example, dough kneading, it is recommended to mechanically process (mix) solutions for dough kneading for 60–70 s or microwave treatment for no more than 20 s.*

**Keywords:** *mechanical activation, mixing, microwave action, water, aqueous solutions, surface tension.*

Purposeful changes in the properties of water in technologies where it plays an important role are carried out everywhere. They get mechanically treated water: passed through filters, ultrafilters and hyperfilters; change the ionic composition of water (the so-called softening) get distilled, deaerated, deionized water, etc. Knowledge of the structure of water, the features of its changes and the possibility of its regulation opens up additional advantages in a wide variety of technologies, for example, in wastewater treatment, purification of water used for technological and food purposes, and intensification of biotechnological processes.

With the participation of water and aqueous solutions, most food mixtures are formed, where the liquid acts as a dispersion medium. The formation of stable surface interactions in disperse systems with the participation of water is based on overcoming the forces of surface tension at the interface between the phases. Upon contact of dissimilar media, a thickening zone is formed, which prevents the formation of intermolecular bonds of dissimilar surfaces, it must be overcome by external mechanical or physical influences.

It has been theoretically and experimentally shown [1-3] that a decrease in the surface energy of a liquid dispersion medium can significantly accelerate the wetting of the surface of the dispersed phase, reduce the energy for mixing, and accelerate subsequent diffusion processes leading to the formation of the structure of the disperse system [4,-6].

Known mechanochemical activation of the surfaces of solids and complex dispersed systems [7-10]. It allows to intensify mass transfer processes on the surface, is effective in wetting and dissolution. However, in our opinion, sufficient attention has not been paid to the reduction of the surface energy of liquids. Is it possible to mechanically activate a liquid by mixing or by other means? The influence of electromagnetic microwave action on the surface properties of water and aqueous solutions is also a little-studied area of knowledge. The purpose of the research was to analyze the effect of mechanical activation and microwave exposure on the surface properties of water.

The object of research was distilled water, bottled drinking water “Berdovskaya taiga” (Certificate of state registration № RU.42.21.01.006.E.000032.04.11 dated April 21, 2011). The experiments were carried out in the laboratories of the Department of “Mechatronics and Robotics of Technological Systems” of the FS-

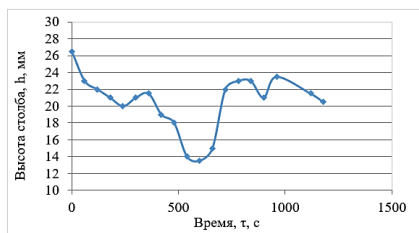
BEI HE KemsU and the Department of Technological Machines and Equipment FSBEI HE “Dalrybvtuz”.

As an experimental setup, we used a household Gemlux mixer with a process capacity of 3 liters and discrete switching of the stirrer rotation speeds. As a stirrer, a whisk nozzle was used, which is used for whipping low-viscosity dispersed systems. The water temperature was controlled by an electronic REXANT thermometer with a division value of 0.1 degrees Celsius. To study the change in surface energy, laboratory glass capillary tubes with a diameter of 0.1 mm were used.

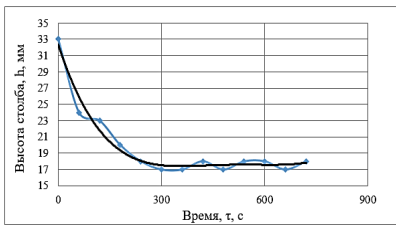
The dependences of the parameters on the time of mixing water and at a mixing frequency of 100 rpm were obtained. The results of the experiments after statistical processing are shown in figures 1-9.

At the beginning of mixing, the height of the rise of water in the capillary (figure 1) decreases in the time interval up to 600 seconds, and then passes into an unstable region. The decrease in the height of the rise of water in the capillary is a direct confirmation of the drop in the surface energy of water in the first 10 minutes of the process to 20%. Then, an unstable increase in the height of the liquid column occurs, which is presumably associated with a decrease in the water temperature.

There is a noticeable difference in the surface energies of water, distilled and drinking bottled “Berdovskaya taiga”. The mixing of water containing ions, the composition of which is determined by the place of origin, decreases much faster. The graph is shown in figure 2.



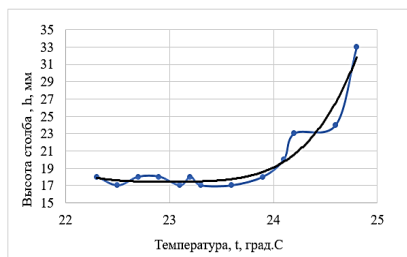
**Figure 1.** Change in the height  $h$  (mm) of a column of distilled water in a 0.1 mm capillary in time  $\tau$  (s) with stirring at a frequency of  $100 \text{ min}^{-1}$



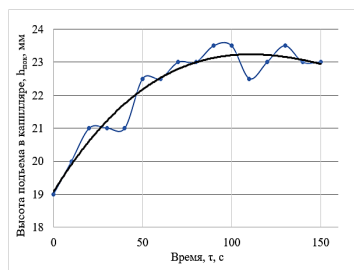
**Figure 2.** Change in the height of the column  $h$  (mm) of drinking water “Berdovskaya taiga” in a capillary of 0.1 mm in time  $\tau$  (s) with stirring at a frequency of  $100 \text{ min}^{-1}$

The graph (figure 3) shows the dependence of the height of the column in the capillary (surface energy) on the water temperature, which changes with stirring. As can be seen, for mechanically activated water, even a decrease in temperature does not give the effect of an increase in surface tension, the opposite phenomenon is observed.

How long the reduced surface energy of water persists after mechanical activation is shown by the graph in figure 4. For distilled water, one minute is enough to restore the properties characteristic of the state of rest.



**Figure 3.** Graph of the height of the column  $h$  (mm) of water distilled in a capillary of 0.1 mm on temperature  $t$  (deg. C)



**Figure 4.** Change in the height of the water column in the capillary 0.1 mm in time after mechanoactivation at rest

The question of the duration of the state of mechanoactivation of water is natural. The parameters of mechanically activated water at rest were measured (figure 4). The surface tension begins to grow and stabilizes after 100–120 s.

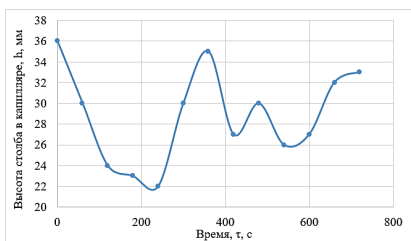
The temperature and surface tension of mechanically activated water at rest were measured. Keeping all experimental conditions constant. The surface tension begins to rise and stabilizes rather quickly, after 100–120 s. Conclusion: it is necessary to use mechanically activated water for technological processes within the next 60–100 s. The time sufficient for mechanoactivation is 60–120 seconds.

The surface properties of water solutions used in kneading dough in production were studied. For the preparation of solutions, the traditional ratio “flour/water/salt” 100/60/2, which is also called the “golden ratio”, was used. The recalculation was made for 2 liters of water. In physical terms, this ratio was 3.330 kg of flour / 2.000 kg of water/0.066 kg of salt. The ratio “water/salt” gave a concentration of water-salt solution of 3.33%.

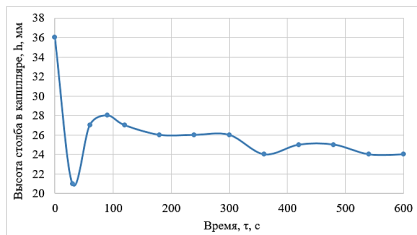
Figure 5 shows the results of measurements of the height of rise of the NaCl solution (3.33%) in a capillary with a diameter of 0.1 mm. The surface tension for a salt solution drops much faster than for distilled water. The minimum is reached after 120–180 seconds of mixing. And after 120 s, the surface energy decreases by 30%.

The surface properties of a 1% flour solution were studied with stirring. The measurement results are shown in figure 6. At the beginning of the process, the height of the solution column in the capillary drops sharply, decreasing by 40% in the first 60 s, then slightly increasing, but retaining a reduced value at the level of

25-30%. Conclusion: for mechanical activation of a 1% aqueous solution of flour, 60 seconds of stirring is sufficient.

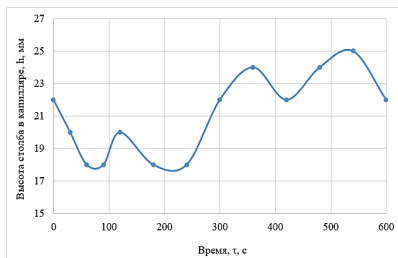


**Figure 5.** Dependence of the rise height of the NaCl solution (3.33%) in a capillary with a diameter of 0.1 mm on the stirring time



**Figure 6.** The dependence of the lifting height  $h$  (mm) of a 1% aqueous solution of flour in a capillary with a diameter of 0.1 mm on the mixing time

An experiment was carried out to measure the surface energy while stirring a 3.3% NaCl solution with a 1% flour solution. The results are presented in figure 7.



**Figure 7.** Dependence of the rise height of the NaCl solution (3.33%) and flour (1%) in a capillary with a diameter of 0.1 mm on the mixing time

The minimum height of the solution column in the capillary corresponded to the mixing time of 60–90 s. The decrease in the surface energy of the solution was about 20%.

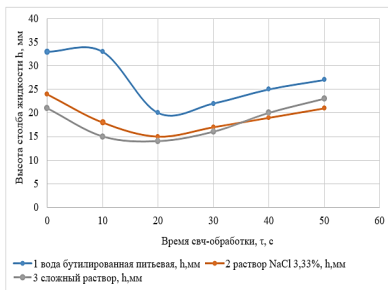
When studying the effect of mixing solutions, it was shown that surface energy minima are achieved at a mixing time of 60–120 s at a stirrer speed of 100 per minute.

The study of the effect of microwave treatment was also carried out by the capillary method with a tube with a diameter of 0.1 mm. Microwave exposure was carried out in a Samsung microwave oven at a power of 750 W. Portions of 100 ml (0.1 kg) were treated. The specific processing power was 7500 W/kg. Processing

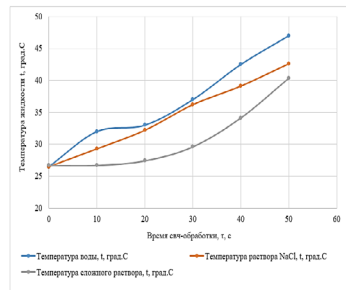
intervals are assumed to be 10 seconds. Not only the surface tension was measured, but also the temperature of the liquid with an electronic REXANT thermometer. Bottled water “Berdovskaya” was studied, an aqueous salt solution of NaCl (3.33%), a complex water-salt-flour solution with the addition of 1% wheat flour of the highest grade to salt (3.33%).

The results of the experiments after statistical processing are shown in figures 8 and 9.

The results of measurements of surface tension through a capillary show that the more foreign substances in the water, the lower its surface energy. Moreover, the minimum was reached at 20 seconds of processing. The growth rate of the temperature of aqueous solutions showed that the more foreign substances in the water, the lower the temperature increase. This phenomenon can be explained from the standpoint of the energies of intermolecular interactions. However, there were some anomalies. Despite the increase in the temperature of the solutions, their surface tension increased after 20 seconds of microwave treatment.



**Figure 8.** Dependence of the liquid column height  $h$  (mm) in a 0.1 mm capillary on the time  $\tau$  (s) of microwave treatment at a specific power of 7500 W/kg



**Figure 9.** Dependence of the liquid temperature  $t$  (deg. C) on the time  $\tau$  (s) of microwave treatment at a specific power of 7500 W/kg

**Conclusions:** Both mechanical and electromagnetic effects change the surface energy of water and aqueous solutions. But their influence is ambiguous. No linear dependencies are observed in these processes. Surface tension during mechanical activation by stirring decreases to a certain minimum for different time intervals for different solutions, and then increases to a certain level. There is a tendency for a noticeable effect of impurities on the surface tension. The more complex the solution and the higher the concentration of impurities, the lower its surface energy. According to the results of research for technological purposes, for example, dough kneading, we recommend the following parameters: mechanical processing (mixing) of solutions for dough kneading for 60-70 s, microwave processing - 20 s.

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使用无人机监测工程结构变形的经验

**EXPERIENCE IN THE USE OF UNMANNED AERIAL VEHICLES  
IN MONITORING THE DEFORMATION OF ENGINEERING  
STRUCTURES**

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抽象的。 本文介绍了一种具有潜在成本效益的远程方法，用于使用配备数码相机和全球定位系统（GPS）的无人机（UAV）监测大跨度结构的变形。 考虑了基于传统测量方法和航空摄影材料的变形模型。 这项工作的目的是描述使用无人机监测土木结构状态并使用摄影测量方法确定水平和垂直运动的创新和有效方法的过程。 文章还讨论了地面测量和航空摄影测量结果的比较。

关键词：无人机，观测，空间，时间，工程结构，稳定性，领土，自然现象，地球动力学过程，环形路线，变形，模型，设计，几何参数，航拍照片。

**Abstract.** *This article describes a potentially cost-effective remote method for monitoring the deformation of large-span structures using an unmanned aerial vehicle (UAV) equipped with a digital camera and a global positioning system (GPS). Models of deformation based on the materials of traditional methods of measurements and aerial photography are considered. The purpose of this work is to describe the process of conducting an innovative and effective approach to monitoring the state of civil structures using unmanned aerial vehicles and determining horizontal and vertical movements using photogrammetry methods. The article also discusses the comparison of the results of measurements of ground survey and aerial photography.*

**Keywords:** *unmanned aerial vehicles, observation, space, time, engineering structure, stability, territory, natural phenomenon, geodynamic process, circular route, deformation, model, design, geometric parameter, aerial photograph.*

Engineering structures are strategically important objects on the functioning of which all sectors of the national economy and the economic growth of the state are entirely dependent. The stability of engineering structures depends on the correspondence of their geometric elements to the given (design) parameters. This correspondence is determined only by systematic and cyclic geodetic observations. The stability of structure structures depends not only on the quality of construction and compliance with building codes, but also on the manifestation of various hazardous natural (geodynamic) processes that can have varying degrees, scales and consequences of impacts. Given the vulnerability of the territory of Tajikistan to modern geodynamic processes, one should expect a high probability of their manifestation, and, accordingly, the possibility of their influence on the stability of engineering structures. The exceptional economic-forming role of engineering structures determines the relevance of studying their stability in time and space.

One of the factors determining the sustainable functioning of engineering structures is the scale, intensity and consequences of natural hazards that represent a certain danger. The territory of Tajikistan is characterized by a complex geological structure, a wide manifestation of various modern geodynamic processes that really threaten the stability of engineering structures. Tajikistan is located in a seismically hazardous zone, where earthquakes of 4-6 magnitudes are not uncommon; from May 2018 to August 2020, 356 earthquakes occurred, of which 10% were magnitude 4 or more. Single ones reached 6 and even 7.5 points. Therefore, for seismically hazardous areas, it is important to create a monitoring technique that allows assessing the consequences of seismic events for large-span structures without being inside the premises [1].

However, the collection of spatial geodetic data in order to assess the state of an engineering structure by the traditional method is very slow and laborious. Geodetic observations of the deformation of engineering structures using unmanned aerial vehicles, in relation to the conditions of Tajikistan. Since 93% of the territories of Tajikistan are mountains and the territory is located in a zone of increased seismicity (9 point zone), the use of this technology has its own characteristics. For example, transport roads passing through mountainous areas, serpentines on mountain slopes, hydroelectric power stations and a number of other structures built in mountainous areas are exposed to geodynamic phenomena and natural and climatic processes. It follows from this that it is necessary to apply an effective method of data collection and a method of analyzing the state of engineering structures. Below is a flow chart of deformation monitoring by unmanned aerial vehicles.

One of the promising ways to solve engineering and geodetic problems in large engineering objects in the near future is remote sensing using unmanned aerial vehicles. In the geospatial field of activity, over the past five years, the UAV has

become a successful method of geodetic support of mining structures [3].

A new collaborative technology in the wider geospatial industry that could benefit both the mining and civil engineering industries. This may have the potential to replace many existing methods. Currently, several companies have launched ultra-compact and lightweight unmanned remote sensing systems. Unfavorable environmental conditions and hard-to-reach places in engineering structures make UAVs an ideal solution for obtaining geospatial data and creating digital geospatial models. The use of such technology is economically expedient and practically effective when it is necessary to make an express assessment of large engineering structures after seismic events, without the executive engineer being inside the structure.

The technology for performing aerial photography of large engineering structures is as follows:

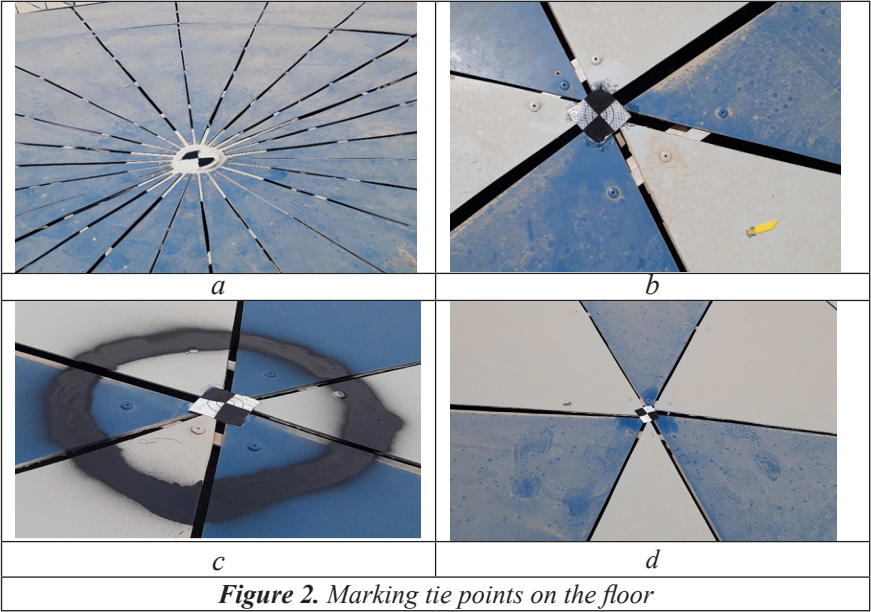
1. An external geodetic network is created;
2. Marks on the roof are coordinated from the points of the external support network  
(measurements in several steps);
3. Aerial photography in progress;
4. Processing of geodetic data and aerial photography is in progress.

UAV technology in civil engineering was adopted during the monitoring of the Water Sports Palace in the city of Dushanbe [2]. In order to accelerate and efficiently perform work on the collection of geospatial data, a flight operations plan (FOP) was drawn up (figure 1).

**Figure 1.** *Flight operations plan (Flight route)*

In the longitudinal and transverse directions, mutually perpendicular routes 1,2,3,4 and 5 were laid at different heights from the ground (1-5 at a height of 65m, 2-4 at a height of 74m and 3 at 80m), and ring routes around the object 1n and 2n, the flight height and camera tilt are chosen so that the entire roof is covered and the shooting axis is perpendicular to the surface being filmed. Due to the fact that points on the surface of the ground and on the ceiling have an excess of more than 20 meters in height, routes at different heights had to reduce the diversity of images and improve automatic recognition.

Aerial photography of the object was carried out by DJI Phantom UAV 5 shooting cycles according to a given project. On the roof of the large-span structure of the sports complex, the coating which consists of aluminum sheets (fig. 2 a, b, c, d) with alternating light and dark geodesic marks are installed. The coordinates of the tie points were determined each time at the time of UAV surveys by the geodetic method using a laser total station with a full reception with an accuracy of 5", and the distances with an accuracy of  $\pm 2\text{mm} + 2\text{mm/km}$ .



The processing of the received aerial survey data was carried out in the Agisoft Photoscan software package, the first two surveys, and in Agisoft Metaspape [2], the last two surveys, according to the exact processing scheme with self-calibration (optimization) of the cameras. Tab. 1 shows a brief description of the shooting, and tab. 2 shows the standard deviations at the reference points.

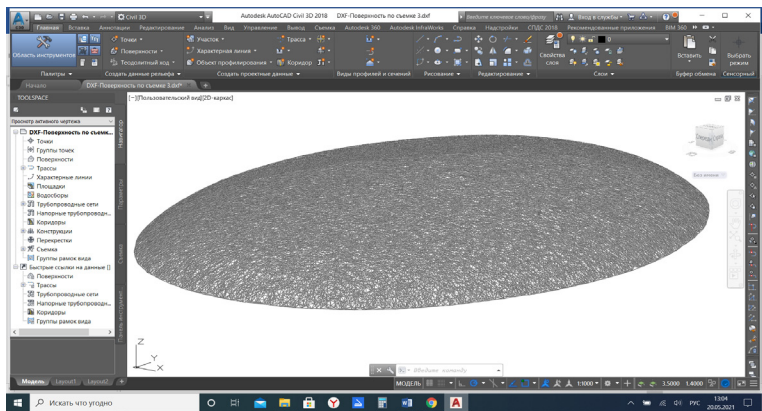
**Table 1**  
*Brief description of aerial photography*

Number	Shooting date	Number of shots	Number of faces	Number of points	Average distance between points, m
1	15.08.2019	159	308 135	622 346	0.085
2	03.12.2019	168	173 051	349 656	0.112
3	15.03.2020	203	141 146	285 165	0.125
4	15.08.2020	225	281 099	567 626	0.090

**Table 2**  
*Standard deviations at reference points*

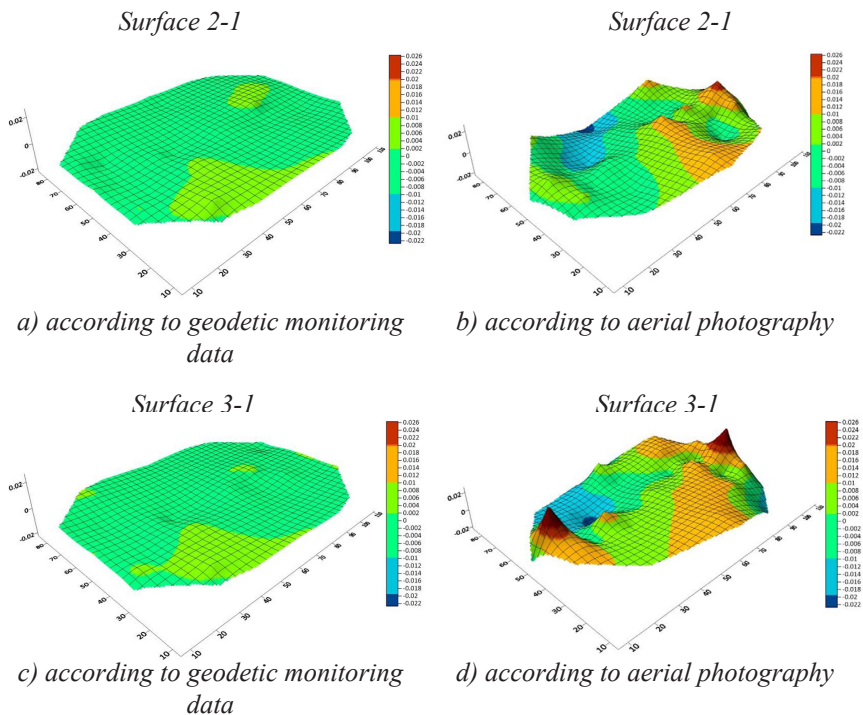
Shooting	$SD_x$ , mm	$SD_y$ , mm	$SD_z$ , mm	$SD_{xyz}$ , mm
1	5.5	6.1	8.5	11.8
2	10.3	7.2	8.8	15.4
3	22.3	14.2	14.8	30.3
4	21.5	15.9	14.9	30.6

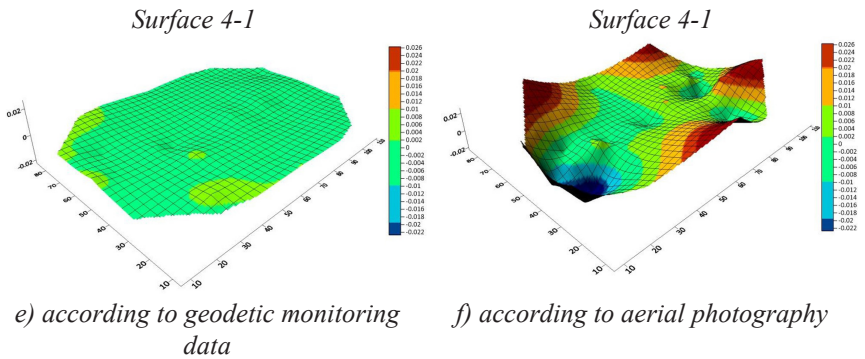
Using the SIFT algorithm (scale-invariant feature transformation), the Photoscan program obtained a dense cloud of points by which it is necessary to determine the deformations of the object. However, in this program it is impossible to compare two surfaces and analyze them, the resulting object model must be exported as a triangulation surface in dxf format (figure 3).



**Figure 3.** *Triangulation shell model in dxf format*

Importing a model from Photoscan to dxf format requires a series of steps to export and import a point cloud. To assess the accuracy of a surface built from a cloud of model points, it is necessary to compare it with some standard. In our example, the surface obtained from aerial photography data is compared with the surface constructed from geodetic data. After that, the interpolation of marks on the roof surface for the marked points, the coordinates of which were determined during geodetic monitoring and the difference surfaces were built, between the corresponding surveys from geodetic monitoring and aerial photography. Since the subsidence between adjacent surveys, according to geodetic monitoring data, is insignificant and lies within  $\pm 3$  mm, for the construction of subsidence surfaces, not adjacent survey dates were taken, the subsidence of which is commensurate with the accuracy of determining marks during geodetic monitoring, but between the first and each subsequent survey date (fig. 4).





**Figure 4.** Deformation surfaces

According to the results of deformation modeling, we should have obtained approximately the same subsidence surfaces. Factors that reduce the accuracy of building an object model using the SIFT algorithm are the low accuracy of aerial photography and its processing (the accuracy of the SIFT algorithm). The accuracy of geodetic measurements when monitoring marks with an engineering total station theodolite was 3.5 mm in plan coordinates and 4 mm in elevation. Such accuracy provides a reliable determination of floor deformations. The accuracy of determining the coordinates of deformation marks could be significantly improved by using high-precision measuring equipment. And the accuracy of monitoring by aerial photography is achieved up to 15 mm, which will be quite enough for monitoring large engineering structures.

### Conclusion

According to the calculation model, the maximum allowable deformation for our test object was 266 mm. Comparison of changes in the surface of the spatial shell, which was studied during geodetic monitoring and aerial photography, showed that the difference between the surfaces does not exceed 26 mm, which is 10% of the allowable deformations. However, if we take only the surface of aerial photography as the initial measurement and track its changes over time, with optimally selected parameters of aerial photography and processing, then it is possible to achieve the required measurement accuracy for express assessment of the state of buildings and structures.

In general, it can be noted that automatic methods for processing aerial photography using the SIFT algorithm require additional research and can provide the necessary accuracy for assessing the state of buildings and structures after major seismic events, when there is a danger for people to be inside. Additional algorithm and filtering studies are required to improve the accuracy of strain detection.



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基于海藻酸盐凝胶的植物提取物在冷熏红鲑生产技术中的应用论证  
**JUSTIFICATION OF THE USE OF PLANT EXTRACTS BASED  
ON ALGINATE-CONTAINING GEL IN THE PRODUCTION  
TECHNOLOGY OF COLD-SMOKED SOCKEYE SALMON**

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抽象的。研究了以海藻酸盐凝胶为基础的植物提取物预处理熏制红鲑鱼半成品对鱼类生化成熟过程的影响。基于感官评价、化学和微生物参数研究的结果，已经确定了用基于藻酸盐凝胶的植物提取物预处理的冷熏红鲑鱼的推荐保质期。所开发技术的经济效益是确定的。

关键词：冷熏，注射剂，贮藏稳定性，植物提取物，海藻酸盐凝胶，经济效益

**Abstract.** *The effect of pre-treatment of semi-finished sockeye salmon for smoking with plant extracts based on alginate gel on the process of biochemical maturation of fish was studied. Based on the results of organoleptic evaluation, studies of chemical and microbiological parameters, the recommended shelf life of cold-smoked sockeye salmon with pre-treatment with plant extracts based on alginate gel has been established. The economic efficiency of the developed technology is determined.*

**Keywords:** *cold smoking, injection, storage stability, plant extracts, alginate gel, economic efficiency*

Millions of tons of hydrobionts are harvested annually all over the world. An important link in the economy of the Kamchatka Krai is the fishing industry. Providing the population of the country with high-quality and safe food is one of the most important tasks facing the agro-industrial complex of Russia.

One of the most important traditional ways of processing and preserving fish products is smoking. At the present stage of development of the fish processing industry, scientists continue to research on improving the technology for the production of fish products, finding ways to increase the duration of their storage, improve quality through the introduction of various additives. The use of vegetable raw materials in the production of cold-smoked fish makes it possible to obtain environmentally safe fish products with increased biological value and improved

organoleptic qualities. In this regard, it seems promising to develop a technology for the production of cold-smoked sockeye salmon processed with extracts from vegetable raw materials of the Kamchatka Krai.

The purpose of the work is the scientific substantiation of the technology of cold-smoked sockeye salmon with a prolonged shelf life. To achieve this goal, the following tasks were solved: analysis of the scientific foundations and practical methods for the production of smoked fish products; study of ways to increase the resistance of cold-smoked fish during storage; determination of the influence of plant extracts on the change in the quality indicators of smoked fish products during its storage; substantiation of the economic efficiency of the developed technology.

The object of research was the technology of cold-smoked sockeye salmon with a prolonged shelf life using vegetable raw materials. The subjects of the study are frozen sockeye salmon that meets the requirements of regulatory documentation, plant extracts, including those based on algal alginate gel, as well as cold-smoked sockeye salmon prepared with pre-treatment with plant extracts.

To obtain extracts, wild plant raw materials growing in the Kamchatka Krai were used. The choice of wild plants was based on the study of the chemical composition and useful properties of each of them. Algae alginate gel was used as a nutritional supplement for fish. The applied gel complies with the requirements of STO 00471585-001-2018 "Food and fish products. Seaweed products. Product requirements. Requirements for the processes of production, storage, sale" [7]. The gel used in the formulations was made from brown algae *Saccharina bongardiana*, obtained off the coast of Kamchatka, by thermal treatment of pre-prepared algae thalli using sodium carbonate (baking soda) as an extractant, followed by neutralization of the alkaline medium with citric acid.

To determine the stability of cold-smoked sockeye salmon during storage, a study was made of the effect of the selected phytocomposition on products. From plant parts, as well as alginate gel, a plant extract was prepared, which was mixed with a saline solution and introduced into fish raw materials during salting, which was carried out by injection. When injecting, diffusion-osmotic processes begin simultaneously throughout the entire thickness of the fish, in addition, the advantage of this method is the possibility of adding flavoring, antioxidant and other additives together with the salt solution, as well as the uniformity of salting, reducing the salting time. After salting, sockeye salmon was sent for smoking. Then the fish was packed and stored under certain temperature and humidity conditions. During storage, the change in microbiological parameters was determined, thus establishing the effect of plant components on the stability of cold-smoked sockeye salmon during its storage.

When determining the chemical indicators of the quality of semi-finished products and finished products, we were guided by the requirements of GOST 7636 “Fish, marine mammals, marine invertebrates and products of their processing. Methods of analysis” [3]. When conducting studies on the influence of various factors on the rate and depth of maturation of fish raw materials during pre-treatment with plant extracts based on alginate gel and subsequent smoking, buffer capacity, accumulation of amine nitrogen (AN), accumulation of volatile base nitrogen (VBN) [3], acid number, peroxide value [3] and organoleptic indicators. Buffering was determined by the titrimetric method according to GOST 19182-2014 “Fish preserves. Methods for determining buffer capacity” [2]. Determination of amine nitrogen was carried out by the method of formal titration in the modification of Chernogortsev A.P. [4]. When conducting research on the effect of plant extracts on the shelf life of smoked fish, indicators were determined - the accumulation of volatile base nitrogen (VBN), acid number, peroxide number, organoleptic indicators.

To determine the shelf life of finished products, microbiological indicators of products were also determined. The studied microbiological indicators of products were compared with the indicators established by the requirements of the Technical Regulations of the Customs Union “On Food Safety” (TR CU 021/2011). The determination of the shelf life was carried out in accordance with MUK 4.2.1847 “Sanitary and epidemiological assessment of the rationale for the shelf life and storage conditions of food products” [6].

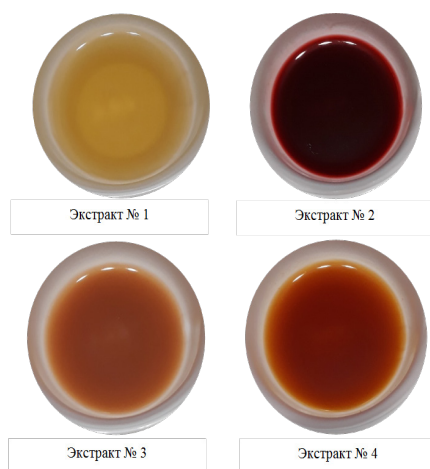
The use of smoke preparations is common and is considered the most effective way to protect products from the accumulation of carcinogens today. Many scientists are working on improving smoking methods. The search for new ways to improve the methods of smokeless smoking is an important area of research. We have proposed the use of plant extracts based on alginate gel in the technology of cold-smoked fish in a smokeless way. Extracts after salting were introduced into the thickness of the fish by injection. The “VNIRO” smoke preparation was used as a smoking liquid.

As a raw material for the preparation of extracts, we used alginate gel, as well as Kamchatka wild plants (*common lingonberry* (*Vaccinium vitisidaea*), *elderberry* (*Sorbus sambucifolia*), *wrinkled wild rose* (*Rosa rugosa*)).

The appearance of the extracts used for the processing of salted fish is shown in figure 1.

The extracts were prepared as follows. Alginate gel was poured with water at a temperature of 80°C, stirred until dissolved, then poured dried powdered fruits and left to infuse for 12 hours. After that, the extracts were filtered and used for fish processing.

The fish was salted in a dry cooled way, the salting was interrupted when the mass fraction of salt in the fish reached 5–6%, then the fish was washed with saline, soaked in fresh water to desalinate the surface layer for an hour, after the water drained into the thickness of the fish, the extracts were injected by injection and left to equalize salinity and redistribute components at a temperature of 2–4°C for two days. The control sample was prepared without treatment with extracts. To determine the effect of pre-treatment with plant extracts on the degree of biochemical maturation, it is necessary to study changes in chemical, rheological and organoleptic parameters in sockeye salmon tissues.



**Figure 1.** *Plant extracts based on alginate gel.*

Indicators characterizing changes in proteins and lipids during biochemical maturation are buffering capacity, accumulation of amine nitrogen (AN) and volatile base nitrogen (VBN), and changes in acid and peroxide numbers [5].

The studies were carried out during the storage of samples of salted sockeye salmon at a temperature of 2–4°C. The results of studies of the chemical parameters of the samples are shown in table 1.

**Table 1**  
Dependence of changes in chemical parameters  
on the duration of storage of salt salmon

Indicator name	Sample under study	Storage duration, days				
		0	3	6	9	12
AN, mg/100 g	Control	34.2	45.7	71.3	102.8	127.6
	Test № 1	34.3	45.8	71.4	102.8	127.7
	Test № 2	34.2	45.6	71.3	102.7	127.6
	Test № 3	34.1	45.6	71.2	102.6	127.5
	Test № 4	34.3	45.7	71.3	102.7	127.6
VBN, mg %	Control	5.4	9.2	11.1	13.6	15.1
	Test № 1	5.5	9.3	11.2	13.5	15.2
	Test № 2	5.4	9.2	11.1	13.7	15.3
	Test № 3	5.3	9.1	11.2	13.6	15.2
	Test № 4	5.4	9.3	11.3	13.6	15.1
Buffer, deg.	Control	53	57	66	72	77
	Test № 1	54	58	65	72	77
	Test № 2	54	57	67	73	78
	Test № 3	54	58	66	73	78
	Test № 4	54	58	67	72	77
Acid number, mg KOH per 1 g	Control	3.1	3.6	5.3	7.1	8.2
	Test № 1	3.2	3.7	5.4	7.2	8.3
	Test № 2	3.3	3.6	5.3	7.1	8.2
	Test № 3	3.2	3.7	5.4	7.1	8.3
	Test № 4	3.3	3.7	5.3	7.2	8.3
Peroxide number, % J <sub>2</sub> per 1 g	Control	0.014	0.015	0.017	0.020	0.023
	Test № 1	0.015	0.016	0.018	0.021	0.024
	Test № 2	0.015	0.015	0.017	0.020	0.023
	Test № 3	0.016	0.016	0.018	0.021	0.023
	Test № 4	0.016	0.015	0.018	0.021	0.024

As can be seen from the results of table 1, during refrigerated storage of salted sockeye salmon samples, a noticeable increase in volatile base nitrogen, amine nitrogen and buffering occurs, which is the result of changes in proteins that indicate fish maturation. It can be seen that protein hydrolysis proceeds similarly in all samples. According to literature data, the value of buffering in mature sockeye salmon is in the range of 65–75 deg. [Blagonravova, M. V., 2006]. The research results showed that these values are achieved in all samples on the 6th day. The values of peroxide and acid numbers can be used to judge changes in lipids. The rate of hydrolysis and lipid oxidation is similar for all samples.

When determining organoleptic indicators, it was found that when storing samples of salted salmon at a temperature of 2–4°C, the experimental samples showed signs of a ripened product (the appearance of a “bouquet” of maturation, softening of the meat consistency), as in the control sample for 6–7 days.

Thus, on the basis of the conducted studies, it can be concluded that the maturation process in the experimental samples proceeds similarly to the control one. Consequently, the treatment of fish with plant extracts does not have a special effect on the maturation process.

Salted sockeye salmon samples - control and experimental (with pretreatment with extracts based on alginate gel) were dried at a temperature of 20–22°C in a convection oven for 3 hours, then treated with the “VNIRO” smoking preparation and smoked at a temperature of 22–25°C. Smoking was completed when the mass fraction of water in the samples reached 53–55%.

Samples of cold smoked fish are shown in figure 2.

Determination of organoleptic indicators was carried out by tasting.

The assessment was carried out according to the following criteria: appearance, texture, skin color, smell, taste, general impression. All samples of cold-smoked sockeye salmon had positive organoleptic characteristics, the samples prepared with pre-treatment with extracts based on alginate gel with the addition of lingonberries and wild rose (Extract №2 and extract №3) received the best assessment.

Changes in organoleptic parameters were also determined during storage of samples of cold-smoked sockeye salmon at a temperature of minus 8°C - minus 4°C. According to the results of the organoleptic evaluation of samples during storage, it was revealed that in the control sample, positive organoleptic characteristics persisted for 12 days, in samples treated with extracts, organoleptic characteristics remained normal for 16–18 days.

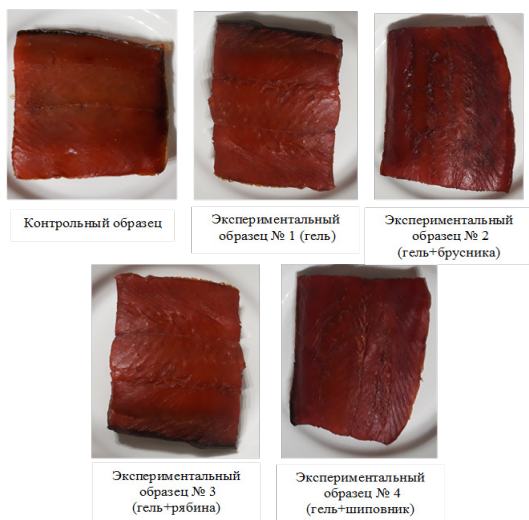


Рисунок 3.3 Образцы нерки холодного копчения

*Figure 2. Samples of cold smoked sockeye salmon*

To study the effect of plant extracts on the shelf life of smoked fish, the accumulation of nitrogen of volatile bases, acid number, and peroxide number were determined (table 2).

**Table 2.**  
*Changes in the chemical parameters of cold-smoked sockeye salmon during storage*

Indicator name	Storage time, days	Change VBN, mg%	Change in peroxide value, %J <sub>2</sub> per 1 g of fat	Change in the acid number of fat, mg KOH per 1 g
Control sample	0	9.2	0.015	3.6
	3	9.6	0.018	4.2
	6	10.2	0.024	5.4
	8	10.9	0.029	6.3
	10	11.8	0.035	7.6
	12	18.4	0.042	9.1
	14	23.6	0.050	11.3
	16	34.8	0.061	14.7
Experimental samples	0	9.3	0.016	3.7
	3	9.5	0.017	4.0
	6	9.9	0.019	4.5
	8	10.3	0.022	5.1
	10	10.8	0.024	5.9
	12	12.1	0.025	6.6
	14	14.9	0.026	7.2
	16	21.3	0.028	8.1

From the results of the studies presented in table 2, it can be concluded that in the control sample, the breakdown of protein substances occurs more intensively, as evidenced by a significant increase in VBN. The most significant change in VBN values in the control sample occurs after 16 days of storage, while in the experimental samples less pronounced changes are observed throughout the entire storage period.

During storage, there is an increase in the values of acid and peroxide numbers of fat. In experimental samples, the increase in these indicators is less pronounced than in the control. The acid number of fat in the experimental samples remains within acceptable limits throughout the entire storage period, in contrast to the control sample.

Thus, studies show that the treatment of sockeye salmon before smoking with plant extracts based on alginate gel inhibits the processes of protein breakdown and lipid oxidation in the finished product, providing greater storage stability. Perhaps this is due to the inhibitory and antioxidant properties of the gel and wild plants.

Microbiological studies were also carried out.

According to the results of the organoleptic evaluation, chemical and microbiological indicators, we set the shelf life for the control sample - 10 days, for experimental samples - 14 days.

At the next stage of the work, the economic efficiency of using the improved technology of cold-smoked sockeye salmon in production conditions was determined. The calculations of the economic efficiency of the cold-smoked sockeye salmon production line made it possible to obtain technical and economic indicators, which are given in table 3.

**Table 3**  
*The main technical and economic indicators of the developed technology of cold-smoked sockeye salmon with preliminary treatment with extracts based on alginate-containing gel*

Indicator	Value
Production in physical terms, tons per year	46.2
Cost of raw materials for the year, thousand rubles	19 083.8
Expenses for auxiliary and packaging materials, thousand rubles	3 159.5
Energy consumption, thousand rubles	129.98
Revenue from product sales, thousand rubles	31 416
Number of employees, people	8
Wage fund, thousand rubles	3 752.1
Cost of 1 ton of products, thousand rubles	576.8
Selling price of 1 ton of products, thousand rubles	680.0
Profit from the sale of products, thousand rubles	4 767.8
Product profitability, %	17.9

On the basis of studies to justify the technology of cold-smoked sockeye salmon when used to increase the shelf life of plant extracts based on alginate-containing gel, extract formulations were developed, and the effect of pre-treatment with plant extracts based on alginate gel on the maturation process of fish was studied. The quality indicators were determined and the shelf life of cold-smoked sockeye



salmon with pre-treatment with plant extracts based on alginate gel was established. The results of studies of the physicochemical parameters of cold-smoked sockeye salmon during storage showed that the treatment with plant extracts based on alginate gel, due to the inhibitory and antioxidant properties of the extracts, inhibits the processes of protein breakdown and lipid oxidation, providing greater stability of caviar during storage. Based on the results of an organoleptic assessment, studies of chemical and microbiological indicators, the recommended shelf life of cold-smoked sockeye salmon with pre-treatment with plant extracts based on alginate gel is 14 days, which is 4 days more than the shelf life of traditional products. The main technical and economic indicators of products prepared according to the developed technology have optimal values: when using plant extracts based on alginate-containing gel, the cost of 1 ton of products is 576.8 thousand rubles, the selling price of 1 ton of products is 680.0 thousand rubles, profitability is 17.9%.

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使用语义组进行情感分析

## THE USE OF SEMANTIC GROUPS FOR SENTIMENT ANALYSIS

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抽象的。 本文处理解决机器学习问题时出现的文本特征描述问题。 提出了一种语义组形式的指示性文本模型, 并给出了在该模型上训练的分类器质量的评估。

关键词: 机器学习, 文本分析, 情感分析, 观点分析, 方面分析, 文本表示, 特征描述, 分类质量。

**Abstract.** *The article deals with the problem of feature description of texts that arises when solving machine learning problems. An indicative text model in the form of semantic groups is proposed, and an assessment of the quality of the trained classifier on such a model is given.*

**Keywords:** *machine learning, text analysis, sentiment analysis, opinion analysis, aspect analysis, text representation, feature description, classification quality.*

### Introduction

For any supplier of goods, services or services, it is important to receive feedback from consumers. With the development of e-commerce, it became possible for suppliers to collect consumer opinions quickly and in large volumes. Most often, the opinion contains some emotional assessment about the respective product. In general, on the basis of such an assessment, customer satisfaction can be judged. However, consumer sentiment can change over time, so it is important to analyze opinions over time as well. This allows you to quickly respond to market changes or problems detected by consumers in the product. All these tasks are solved within the framework of aspect analysis of opinions.

The purpose of the work: to evaluate the effectiveness of using semantic groups to represent texts instead of more traditional models based on frequency analysis.

### Aspect analysis of opinions

An opinion is expressed by someone, about something, at some time and with some tone - this allows you to highlight the main components of the opinion: the

object of the opinion, the tone, the carrier of the opinion and the time of expression of the opinion. It should be noted that most often an opinion contains not only judgments about the object as a whole, but also about its components or properties - attributes. Then the opinion can be defined as a five-place vector [1]:

$$O_{ijkl} = (e_i, a_{ij}, s_{ijkl}, h_k, t_l) \quad (1)$$

where  $e_i$  – object of opinion,  $a_{ij}$  – object attributes,  $s_{ijkl}$  – attribute tonal score,  $h_k$  – author of the opinion,  $t_l$  – time of expression. If the opinion refers to the object itself, the special attribute *GENERAL* is applied, that is, the entity  $e_i$  itself is used as the  $a_{ij}$  aspect. Thus, we can declare that the goal of aspect analysis is to find this vector.

The tasks of extracting entities and their aspects can be solved in several ways: statistical approach, linguistic approach, machine learning [2].

The statistical approach is based on the frequency characteristics of terms and on the assumption that most entities and aspects are nouns or nominal phrases. With a statistical approach, the task of extracting entities/aspects is reduced to three main steps:

1. Search for nouns.
2. Calculation of the frequency of use.
3. Choice of words with the highest frequency.

The linguistic approach relies on the peculiarities of the syntactic structure of natural languages, believing that in opinions the tonally colored part often comes after the essence/aspect. Using templates that take into account such a position of words will help solve the problem of extracting the corresponding terms.

Finally, machine learning methods can be used to extract entities/aspects, since such tasks can be represented as two-class classification tasks for the desired terms and all the rest.

The task of determining the sentiment score can also be represented as a classification problem, for example, into three sentiment classes: positive, neutral, negative.

The remaining components, the author of the opinion and the time of expression, are most often represented by the aggregator of reviews (opinions), so we will assume that they are known.

### **Semantic groups**

Machine learning models work with indicative descriptions of the objects under study. This means that it is necessary to present an opinion, that is, a text written in natural language, as a set of features.

A vector model in word processing is a way of characterizing texts by specifying a vector of size  $N$ . Such a vector contains some weight estimate of the words

found in a given corpus (set) of texts. Thus, each document is associated with a vector representing the corresponding text in the same  $N$ -dimensional space for this collection of texts.

Methods for assigning a weight score to words are based on the frequency of occurrence and/or absence of specific words (word forms), that is, when calculating frequencies, a strict match of words is used. This creates an obvious problem - all word forms of the same lexeme will be recognized as different words. The solution is stemming - finding the base form of the word. However, this does not solve another problem of using similar words - synonyms.

In a natural language, one can be very free with the word and its synonyms, freely replacing them with each other, but without distorting the semantic load. That is, a more correct decision should be considered not by counting the frequencies of specific words, but by the “ideas” and “meanings” embedded in these words. In other words, when compiling an indicative description, it is necessary to preserve the semantic meanings of words.

To do this, you need to be able to determine how words are similar or different. A similar problem is solved by word2vec, a group of interconnected models of artificial neural networks used in text analysis [3]. word2vec takes a corpus of texts as input and produces a set of vectors as output. Each such vector represents a feature description of any word encountered in the input corpus of texts. The calculation of weights is based on the idea of context: different terms occurring in the context of the same words are likely to have similar meanings.

Having received a model that determines the degree of similarity of words, you can begin to compile semantic groups - clusters containing words similar in meaning. Having received such clusters, it is possible to replace terms in texts with the numbers of the corresponding semantic groups.

### **Machine learning**

As mentioned earlier, the problem of sentiment detection can be solved using machine learning methods, as a classification problem. The use of machine learning methods is also due to the fact that it is impossible to obtain complete a priori information about all texts that can potentially be analyzed as part of the aspectual analysis of texts.

With the help of machine learning, you can create a system capable of learning, that is, one that is able to extract knowledge from known (labeled) data and use this knowledge to solve practical problems. Formally, this can be written as follows.

Let there be a certain set of problems of class  $C$ , for which a certain set of experience  $EX$  is given and a measure of quality  $L$  is defined. Then, the presence of learning from experience  $EX$  regarding the class of problems  $C$  in the sense of the measure of quality  $L$  can be said if, upon presentation of a new experience,

$EX'$  increases the quality of the solution to a problem of class  $C$ , measured by the measure  $L$ .

The task of determining sentiment is a classification task, that is, any appropriate method for constructing a classifier can be used. For text analysis, it would be preferable to use a decision tree model, since trees show good results in the case of a large number of features and in the presence of dependencies between the features themselves. To further increase the classification accuracy, several trained trees can be combined into an ensemble - a tree decision committee (random forest).

An ensemble of methods is several algorithms (trained models) combined into a group. Each model presents its own solution to the task, and then the final solution is determined by "voting". The ensemble presents a more precise solution; this is due to the fact that the models that make up the ensemble are trained on different samples from the training set. Low correlation allows models to make decisions based on different subsets of the feature description.

### Results

Having compiled a feature description of training texts using semantic groups and trained a classifier (random forest) on them, you can start compiling a description of  $ROC$ st texts and evaluate the quality of the resulting model.

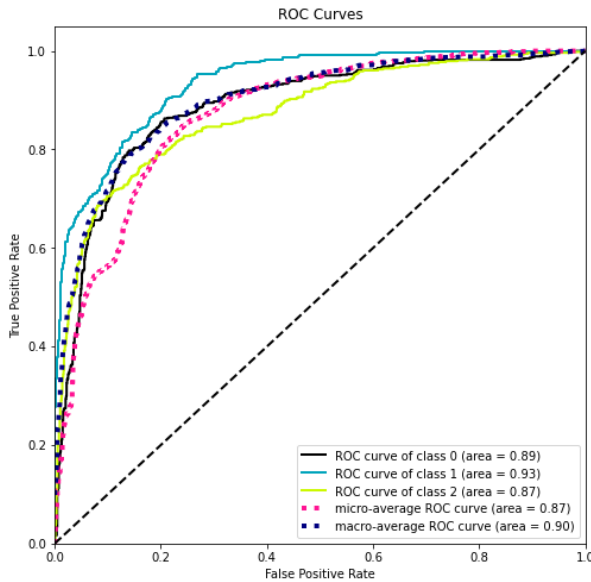
-curve - a plot of sensitivity and the reciprocal of specificity - the relationship between the probability of true and the probability of false detection [4]. In other words, with increasing sensitivity, the recognition of objects that actually belong to the class under study improves, but at the same time, the chance of falsely identifying an object as belonging to the class increases.

$$Sensitivity_i = TRP_i = \frac{TP_i}{P_i} = Recall_i = \frac{TP_i}{TP_i + FN_i} \quad (2)$$

$$Specificity_i = TNR_i = \frac{TN_i}{N_i} = \frac{TN_i}{TN_i + FP_i} \quad (3)$$

$$1 - Specificity_i = FNR_i = \frac{FP_i}{N_i} = \frac{FP_i}{TN_i + FP_i} \quad (4)$$

Fig. 1 shows  $ROC$ -curves by sentiment classes (0 - negative, 1 - neutral, 2 - positive) and averaged curves. After analyzing the type of graphs, we can talk about the satisfactory quality of the classification [5], in addition, the areas under curves  $AUC$  are quite close to 1, which is also a quality indicator [6].



**Figure 1.** *ROC-curves for the resulting classifier.*

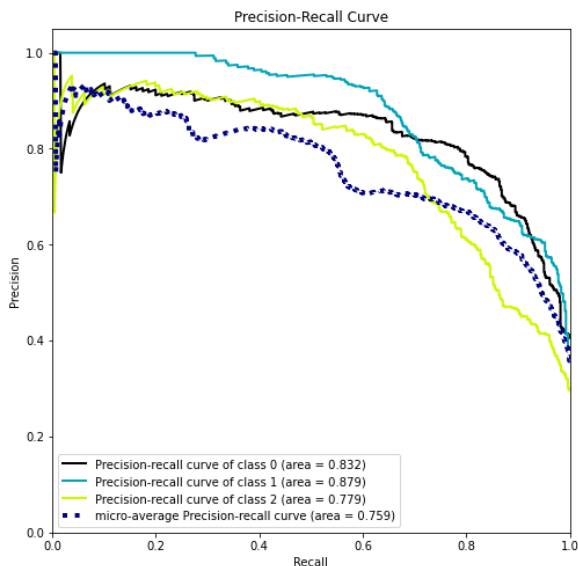
Note that **ROC**-curves can overestimate the performance indicators for cases with unbalanced classes [7]. Therefore, in addition to them, one more type of curves should be constructed.

**PR**-curve – Precision and recall are plotted along the axes.

$$Precision_i = \frac{TP_i}{TP_i + FP_i} \quad (5)$$

$$Recall_i = \frac{TP_i}{TP_i + FN_i} \quad (6)$$

The quality estimate in this case will also be the area under the curve, which will coincide with the average accuracy value. The resulting quality value  $AUC = 0.759$  can be improved in the future.



**Figure 2.** *ROC-curves for the resulting classifier.*

To further improve the quality of classification, attention should be paid to finer tuning of the classifier training parameters.

## Conclusion

Having compiled a feature description of texts using semantic groups, trained a classifier and tested it, we made sure that the use of semantic groups for text analysis tasks is justified. They are not inferior to the classical ways of presenting texts and at the same time allow you to save more information from the text (semantic load), and as a result, present a more accurate model of the texts under study.

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