



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

ECONOMIC SCIENCES

- 俄罗斯联邦现代经济中数字金融资产市场的发展方向
Directions for the development of the digital financial assets market in the modern economy of the Russian Federation
Koshelev Kirill Andreevich.....9
- 经济政策不确定性对投资活动的影响：中国和俄罗斯
Economic Policy Uncertainty's Effect on Investment Activity: China and Russia
Vorobyeva Viktoria Vladimirovna, Zou Jiahong.....14

JURIDICAL SCIENCES

- 家庭暴力侵害儿童案件的应对形式
Forms of counteraction to cases of violence against children in the family
Kalistratova Natalya Alexandrovna.....25
- 关于交通运输业重组和引入数字技术的问题
On the issue of the reorganization of the transport industry and the introduction of digital technologies
Ananyeva Ekaterina Olegovna.....31

PEDAGOGICAL SCIENCES

- 山东师范大学赫尔岑国际艺术学院教育环境中俄语教学的实践
The practice of teaching the Russian language in the educational environment of the Herzen International Art College (HIAC) at Shandong Normal University
Gavrilova Valentina Leonidovna, Gasselblat Olga Alexandrovna, Sergeeva Olga Vladimirovna.....37
- 利用互联网技术准备特殊科目ESP课程的实践课程
Practical classes on the preparation of the ESP course in special subjects using Internet technologies
Buzina Yulia Nikolayevna, Bernatskaya Marina Vladimirovna.....42
- 从小学一年级教学视角——幼儿园与小学衔接数学教育的现状与对策研究
From the perspective of first grade teaching in primary school - Research on the Current Situation and Countermeasures of Mathematics education in the Connection between Kindergarten and Primary School
Gu Rong.....47

PHILOLOGICAL SCIENCES

- 新加坡式英语短信中的语言偏差（基于新加坡国立大学短信语料库）
Linguistic deviations in Singlish SMS (based on The NUS SMS Corpus)
Temirova Dzhannet Alibulatovna.....54
- 对 V. G. 的看法 拉斯普京在中国批评中的创造力
Perception of V.G. Rasputin's creativity in Chinese criticism
Markova Tatiana Nikolaevna.....63

HISTORICAL SCIENCES

- 印欧话语背景下的特里皮利亚文化和颜那亚文化
Trypillia and Yamnaya cultures in the context of Indo-European discourse
Alekseev Konstantin Aleksandrovich.....69

ART HISTORY

- “美国五人组”在美国作曲学校形成中的作用
The role of «The American Five» in the formation of the composition school in the USA
Anuchin Artem Maximovich.....75
- 城市建筑和艺术环境形成的当代方面
Contemporary aspects in the forming of the architectural and art environment of the city
Iakovleva Ksenia Sergeevna.....84
- 巴赫奇萨赖保护区历史、文化和考古博物馆收藏的克里米亚鞑鞑妇女头饰的装饰研究
Ornamental studies of the Crimean Tatar women's headdresses from the collection of the Bakhchisaray Historical, Cultural and Archaeological Museum of the Reserve
Akchurina-Muftieva Nuriia Munirovna.....90

CULTUROLOGY

- 价值观作为文化的意义建构元素
Values as the sense-making element of culture
Chernyakova Natalia Stepanovna.....95

PSYCHOLOGICAL SCIENCES

- 气质类型的创新观点：科学假设
An innovative view of temperament types: a scientific hypothesis
Malakhova Asol Nikolaevna.....99
- 自闭症谱系障碍儿童的心理和心理生理特征综述
A review of psychological and psychophysiological characteristics of children with autism spectrum disorder
Vorobyeva Elena Viktorovna, Shevchenko Irina Gennadevna, Rahimova Elena Filippovna.....103

MEDICAL SCIENCES

青春期学生运动员夜间睡眠时间及其对体能的影响

The duration of night sleep and its influence on the physical performance of student-athletes of the period of adolescence

Prokopyev Nikolay Yakovlevich, Ananiev Vladimir Nikolaevich, Khromina Svetlana Ivanovna, Semizorov Evgeny Alekseevich, Gurtovoy Elisey Sergeevich.....112

皮肤老化

Skin aging

Mezentsev Yury Alexandrivich, Osipova Olga Alexandrovna, Gorelik Svetlana Girshevna, Belousova Oxana Nikolaevna.....123

混合焦虑和抑郁症患者的实验室和临床相关性

Laboratorial and clinical correlations in patients with mixed anxiety and depressive disorder

Bakuleva Nadezhda Ilinichna, Zemskov Andrey Mikhailovich, Shiryayev Oleg Yurievich.....131

多领域医院医疗保健组织的营销管理

Marketing management in the health care organization within multifield hospital
Albaev Rustam Kuanyshbekovich.....137

表观遗传母体因素在子宫肌瘤形成中的作用

The role of epigenetic maternal factors in uterine myoma formation
Kolesnikova Svetlana Nikolaevna, Dubinskaya Ekaterina Dmitriyevna, Kholban Irina Vasilevna, Alyoshkina Elizaveta Vladimirovna.....142

瘦素抵抗背景下外源性体质性肥胖儿童的综合治疗

A comprehensive approach to the treatment of children with exogenous constitutional obesity against the background of leptin resistance

Vladimirova Yulia Vladimirovna, Zhirnov Vitaly Alexandrovich, Mazur Lilia Ilyinichna.....155

关节式和静态垫片治疗膝关节假体周围感染

Articulating and static spacers in the treatment of periprosthetic knee infection
Elena V. Preobrazhenskaya, Lyudmila V. Lyubimova, Evgeniy A. Lyubimov.....163

儿童自体牙齿移植的现代表述

Modern representations about autotransplantation of teeth in children
Zakirov Taras Valerievich, Brusnitsyna Elena Viktorovna, Lyjgkih Alexander Vladimirovich.....171

BIOLOGICAL SCIENCES

杏仁核复合体中央核在应激状态下大鼠全身血流动力学调节中的作用

The role of the central nucleus of the amygdala complex in the regulation of systemic hemodynamics of rats under stress

Bakulina Ekaterina Ivanovna.....179

CHEMICAL SCIENCES

使用聚乙烯醇和微晶纤维素提高食品涂层保护膜的阻隔性能

The use of polyvinyl alcohol and microcrystalline cellulose to improve the barrier properties of protective films of food coatings

Naumova Anna Vadimovna, Ishevsky Alexander Leonidovich,

Gunkova Polina Isaevna, Danilyuk Maria Alexandrovna.....185

纳米级无涂层硅的性能和体内毒性测定

Properties and in vivo toxicity assay of nanoscale uncoated silicon

Konstantin V. Zolotarev, Anton N. Mikhailov, Marina V. Mikhailova.....189

PHYSICAL AND MATHEMATICAL SCIENCES

图上的 NP 完全问题和枚举方法

NP-complete problems and enumeration methods on graphs

Kudelya Viktor Nikolaevich.....199

TECHNICAL SCIENCES

利用可再生能源产生冷气

Generation of cold with renewable energy

Mironov Viktor Vladimirovich, Ivanyushin Yuri Andreevich,

Suglobov Daniil Alekseevich.....206

用于优化勘探、勘探和注入井运营的软件

Software for optimizing the operation of exploration, exploration and injection wells

Gabdrakhmanova Klara Fatkullovna.....214

水泥生产中识别问题规范程序

The procedure for regularizing the identification problem in the cement production

Khasanov Jasur Rustamjonovich.....218

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俄罗斯联邦现代经济中数字金融资产市场的发展方向
**DIRECTIONS FOR THE DEVELOPMENT OF THE DIGITAL
FINANCIAL ASSETS MARKET IN THE MODERN ECONOMY OF
THE RUSSIAN FEDERATION**

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抽象的。作者的研究致力于提出俄罗斯联邦数字金融资产市场发展的主要方向。通过对数字金融资产的类别及其经济本质的界定，建议修改国家关于数字金融资产市场的立法，将其归类为非票据证券，使数字金融资产纳入非票据证券成为可能。成熟的民法流通。除了改变数字金融资产市场运作的法律方面外，作者还基于综合和系统的方法制定了数字金融资产市场形成和发展的组织、经济和体制机制。

关键词：数字金融资产；数字货币；加密货币；代币。

Abstract. *The author's research is devoted to the proposal of the main directions for the development of the digital financial assets market in the Russian Federation. Through the definition of the category of digital financial assets and their economic essence, it is proposed to amend the national legislation on the market of digital financial assets by classifying them as non-documentary securities, which will make it possible to include digital financial assets in full-fledged civil law circulation. In addition to changing the legal aspects of the functioning of the digital financial assets market, the author formulates organizational, economic and institutional mechanisms for the formation and development of the digital financial assets market based on an integrated and systematic approach.*

Keywords: *digital financial assets; digital currency; cryptocurrency; tokens.*

The rapid development of information technology in the economic sphere is largely due to the spread of distributed ledger technology, blockchain. Cryptocurrencies were one of the first tools based on these technologies. The subsequent application of blockchain technologies, smart contracts led to the creation of various digital assets, which are new tools in the financial market.

The use of technology is aimed at optimizing business processes, digitalizing interactions with customers, market participants and regulators, as well as improv-

ing the quality and personalization of products and services provided to consumers.

Despite the fact that the market for digital assets, especially digital financial assets, has a certain potential, its development in Russia is proceeding at a moderate pace and requires the creation of special conditions for realizing this potential. First of all, a wide variety of types of digital financial assets and methods of their use require an appropriate infrastructure and various mechanisms for their regulation, based on the definition of economic essence.

It should be noted that the relations arising with regard to digital financial assets are influenced not only by civil law, but also by other types of law (administrative, financial, business, and others). It can be said that the institute of Russian digital law that is currently being formed is an intersectoral institution, which requires standard-setting work in many areas.

First of all, it is required to determine the place of digital financial assets in civil circulation.

The category of digital financial assets, according to the author, includes any financial assets presented in digital format, which should have an “economic value” and provide benefits to their owner, endow the latter with certain property rights [5]. In this logic, digital financial assets are an object of civil rights, which, by their economic nature, are paperless securities, the owner of which is the bearer of a set of property rights and legal relations arising in connection with them. Property rights provide the right to own, dispose and use property, as well as the right to claim, arising from civil circulation and expressed in monetary form. Realization of property rights in the case of digital financial assets is carried out using digital technologies. That is, tokens are an analogue of securities that are in free circulation on the stock exchange, with the only difference being that they are circulated on crypto exchanges.

Thus, first of all, it is necessary to clarify the concept of “digital financial assets” in the national legislation on digital financial assets [4]. Classifying digital financial assets as book-entry securities will eliminate the legal uncertainty of the “right to the right” to own and carry out transactions with digital financial assets, which is implemented in the information system.

At the same time, amendments will be required to Federal Law No. 39-FZ of April 22, 1996 “On the Securities Market” and the Civil Code of the Russian Federation [1, 2] in terms of adding the corresponding type of securities.

There is also a need to distinguish between legal regulation:

- digital financial assets and digital currency, in particular the digital ruble. Since digital currency by its nature is not a kind of digital rights, but a digital object and a means of payment, it is necessary to clarify the legal regime of money as an object of rights and supplement the legal norms related to settlements. The

“detuning” of digital financial assets from digital currency is also due to the fact that the circulation of cryptocurrency is officially prohibited on the territory of the Russian Federation, which contradicts the possibility of implementing civil law relations in terms of realizing property rights to digital financial assets.

- digital financial assets and utilitarian digital rights (hereinafter - UDR), which are indicated in Art. 8 of the Federal Law of August 2, 2019 No. 259-FZ “On attracting investments using investment platforms and on amending certain legislative acts of the Russian Federation” [3]. First of all, because DSPs are not digital financial assets, which, as already mentioned, should be understood as book-entry securities that secure part of the value of digital financial assets to their owner. UDR, in turn, include: the right to demand the transfer of things (things); the right to demand the transfer of exclusive rights to the results of intellectual activity and (or) the rights to use the results of intellectual activity; the right to demand the performance of work and (or) the provision of services. That is, the DRM is an example of the fact that in relation to digital objects, rights of obligation (the right to claim), including non-property ones, are possible.

Thus, the classification of digital financial assets as securities in non-documentary form makes it possible to include digital financial assets in civil law circulation.

Additional proposals regarding the improvement of the regulatory framework relate to the main participants in legal relations related to digital financial assets.

In addition to changing the legal aspects of the functioning of digital financial assets, it is necessary to formulate organizational, economic and institutional mechanisms for the formation and development of the digital financial assets market based on an integrated and systematic approach.

Within the framework of an integrated approach, the interrelations and interdependencies of the structural elements of the functioning of the digital financial asset market are studied.

Within the framework of a systematic approach, the organizational and economic mechanism is studied as a whole, by studying the relationship and interdependence of its structural elements, or main blocks. Within the framework of this approach, one should also consider environmental factors: political, economic, social, technological, which have a direct impact on the market of digital financial assets.

The main blocks of the organizational and economic mechanism for the formation and development of the digital financial assets market should be:

- 1) organizational and managerial block.
- 2) a block of legal regulation.
- 3) economic block.
- 4) financial block.

- 5) information support block.
- 6) security block.

At the same time, the main stakeholders in bringing the organizational and economic mechanism into action using the identified approaches are: state authorities and administration, the Bank of Russia, scientific, educational, public organizations; operators of the information system and the exchange of digital financial assets; enterprises and organizations - legal entities of all forms of ownership; individuals.

The institutional mechanism is understood as a system of interactions between economic entities based on institutions, including a system of ordered relationships between market entities at various levels of interaction, which are formed under the influence of established norms and rules in order to ensure the effective functioning of the digital financial asset market in the presence of a certain set of incentives and restrictions.

In this mechanism, it is proposed to distinguish the following blocks:

- 1) target block;
- 2) main unit;
- 3) resulting block.

The target block is represented by the goals and interests of the main groups of subjects - market participants: state authorities and the Bank of Russia, credit institutions, enterprises and organizations, individuals. The goals and interests of these groups at the macro, meso and micro levels can vary significantly.

The main block consists of established rules and norms, which can be based on formal principles, due to the legal regulation of the market, and informal, due to the culture of business turnover, traditions and values that have developed in the economic community, and ethical norms.

The resulting block includes key performance indicators for the functioning of the digital financial assets market to assess the effectiveness of the functioning of the mechanism as a whole. A set of indicators is necessary to identify contradictions or inconsistencies in the activities of economic entities based on formal and informal rules and norms. With the help of incentives and restrictions, contradictions can be eliminated.

This ensures the continuous functioning and development of the proposed institutional mechanism for the digital financial assets market.

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经济政策不确定性对投资活动的影响：中国和俄罗斯
**ECONOMIC POLICY UNCERTAINTY'S EFFECT ON
INVESTMENT ACTIVITY: CHINA AND RUSSIA**

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抽象的。 本文探讨了不确定的经济政策对中国和俄罗斯投资选择的影响。两国都是世界经济的重要参与者，并吸引了大量外国资本。 然而，经济政策缺乏可预测性可能会影响投资者的投资选择。 本文着眼于一些可能导致两国经济政策不确定性的变量，例如税法、货币政策、司法体系和贸易关系的变化。 分析了这种不确定性对投资的影响，例如投资者信心下降、风险升高以及制定长期计划的困难。 本文探讨了中国和俄罗斯经济政策的复杂性，评估了投资者带来的不确定性程度，并探讨了投资界对这种不确定性的反应。 它还着眼于政府如何减少或消除经济政策的模糊性并鼓励投资。 对经济数据、统计指标和该领域其他研究的分析是本研究的基础。 该研究的结果和建议包括减少不确定性和提高中国和俄罗斯对外国投资者吸引力的措施，为改善两国投资环境提供了可行的建议。

关键词：不确定性、投资、经济政策、外贸表现、政治不稳定、外国投资。

Abstract. *The impact of uncertain economic policies on investment choices in China and Russia is examined in this essay. Both nations are prominent players in the world economy and draw considerable sums of foreign capital. The absence of economic policy predictability, however, can influence investors' investment choices. This article looks at a number of variables, such as changes in tax law, monetary policy, the judicial system, and trade relations, that could lead to uncertainty in both countries' economic policies. Analyzed are the effects of such uncertainty on investments, such as diminished investor confidence, elevated risks, and difficulty making long-term plans. The article explores the intricacies of economic policy in China and Russia, evaluates the level of uncertainty posed by investors, and looks at how the investment community has reacted to this uncertainty. It also looks at how the government might reduce or eliminate ambiguity in economic policy and encourage investment. The analysis of economic*

data, statistical indicators, and other studies in this field served as the study's foundation. The study's findings and recommendations, which include steps to lessen uncertainty and make China and Russia more appealing to foreign investors, offer doable suggestions for enhancing the countries' investment climates.

Keywords: *uncertainty, investment, economic policy, foreign trade performance, political instability, foreign investment.*

Capital flows to various countries and investment decisions can both be significantly impacted by economic policy uncertainty. Significant sums of foreign investment are drawn to China and Russia, two powerful economies with international clout. However, concerns about the unpredictability of economic policy may make prospective investors hesitate before making an investment.[1]

The purpose of this paper is to explore the impact of economic policy uncertainty on investment in China and Russia. Both countries face significant challenges and changes in their economic policies that can create problems for investors. Tax regulation, currency policy, the legal system, and trade relations can all be sources of uncertainty affecting investment decisions.

It is important to note that uncertainty can reduce investor confidence, make long-term planning more difficult, and increase investment risks. Research on this issue is practical because it helps to better understand how economic policy uncertainty affects the investment climate and what measures can be taken to address these problems and stimulate investment.

This paper will analyze the characteristics of economic policy in China and Russia, assess the degree of uncertainty faced by investors, and analyze the response of the investment community to such uncertainty. It will also examine the role of the government in eliminating or reducing economic policy uncertainty and encouraging investment.

The study is based on an analysis of economic data, statistical indicators, and previous research in this area. The results and conclusions of this paper are expected to provide practical recommendations and advice for improving the investment climate in China and Russia, as well as to help better understand the relationship between economic policy uncertainty and investment in both countries.

1. Analysis of economic relations between Russia and China

Modern interaction between Russia and China began in 1992 with the signing of an agreement on trade and economic relations, which became the legal basis for cooperation between the two countries. In 2001 the Treaty on Good Neighborhood, Friendship and Cooperation was signed, which establishes the principles and directions of their interaction. Russian-Chinese relations are built on the basis of equal partnership of trust and strategic interaction.[2]

There are more than 30 intergovernmental structures between Russia and China, such as commissions and working groups that interact on various issues, including politics, economics, finance, industry and other areas. The top leaders of both countries meet regularly, which contributes to stability and partnership. Legislative bodies and political and social parties of both countries also cooperate.

After the signing of the Treaty of Good Neighborhood, Friendship and Cooperation, trade and economic ties between Russia and China have been actively developing. Despite the challenges and threats faced by Russia in 2014 as a result of the imposition of sanctions, as well as the downturn in the global economy in 2020 due to the COVID-19 pandemic,[3] trade turnover between the two countries continues to grow. In 2022, it reached a historical record, exceeding \$150 billion. Figure 1 shows the dynamics of foreign trade between Russia and China.

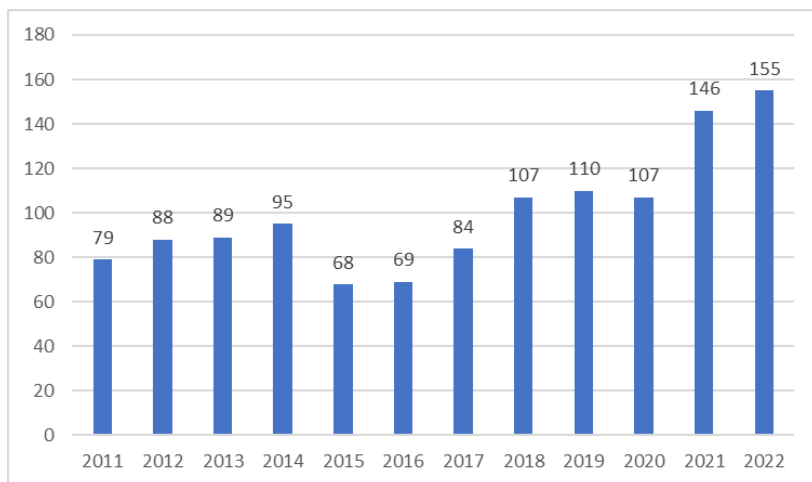


Figure 1. Dynamics of foreign trade volume between Russia and China (billion USD)

Thanks to economic cooperation, which manifests itself in the mutual support of the two economies, the Russian and Chinese leaders plan to increase the volume of foreign trade to \$200 billion in the near future. This goal is based on maintaining the current growth momentum, even in the face of economic and political uncertainty.[4]

Since the beginning of 2010, China has ranked first among all foreign trade partners of Russia in the volume of foreign trade turnover. Every year China strengthens its leading position, and by 2022 its share in Russia's foreign trade turnover is 22%.

Despite the fact that China is Russia’s main foreign economic partner, Russia ranks only 11th among China’s partner countries in terms of foreign trade.[5] In 2022, China’s main foreign economic partners were the European Union and the United States.

However, the issue of the quality of the structure of trade between Russia and China remains relevant. The commodity structure of trade is virtually unchanged and has a significant imbalance. Russia exports low-value-added goods, mainly raw materials and energy, while China imports high-value-added goods, especially mechanical and electrical products.

It should be noted that Russia is still the main supplier of energy resources to the European Union, but in the near future we can expect a decrease in the volume of energy supplies to Europe due to the difficult external situation. This will probably lead to their redistribution towards China, which may further narrow Russia’s foreign trade specialization relative to China. Figure 3 shows the structure of Russian-Chinese foreign trade in 2022.[6]

In addition, the academic and business communities believe that the development of diversification of trade cooperation between Russia and China is hindered by problems with transport, logistics and customs infrastructure in Russia, as well as the difficulties associated with the establishment of links between small and medium-sized enterprises in Russia and China.

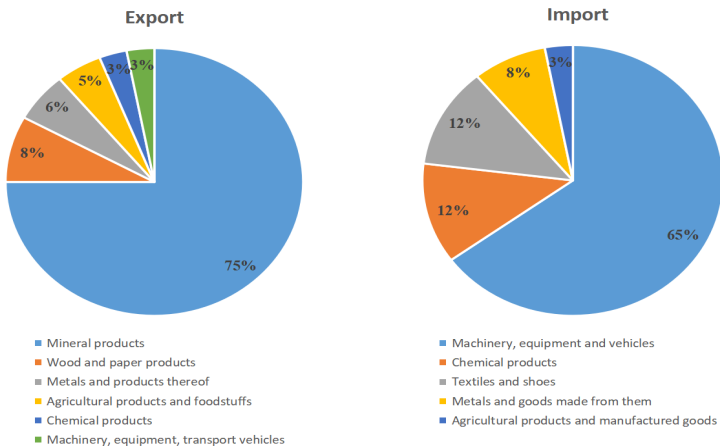


Figure 2. Structure of Russian-Chinese Foreign Trade in 2022

2. Analysis of the Causes of Economic Policy Uncertainty in China and Russia

In today's globalized and interconnected world, economic policy plays a key role in shaping countries' investment climates. Economic policy uncertainty means unpredictability and lack of clarity about government economic policies, regulations and reforms. [7]

Economic policy uncertainty occurs when politicians introduce significant changes or reforms, create ambiguity in policy implementation, or face political and economic instability. The lack of clarity and predictability in economic policy creates an unstable environment for businesses and investors, which in turn affects their investment decisions. Uncertainty leads to hesitation, risk aversion, and investment postponement, as investors are cautious about allocating resources in an uncertain economic environment.

China's rapid economic growth and transition from a centrally planned to a market economy have been accompanied by significant changes in economic policy. The causes of economic policy uncertainty in China can be attributed to various factors, including:

a) Reforms and structural changes: China's ongoing economic reforms and structural changes, such as market liberalization, financial reforms and changes in the legal and regulatory framework, introduce uncertainty as the country goes through a difficult period of transition.

b) Political and leadership changes: A leadership change and political transition in China could disrupt policy continuity and create uncertainty. The transition of power in the Chinese Communist Party and its implications for economic policymaking could affect investor confidence and decision-making.

In addition, there is another factor that creates additional uncertainty for China - the volatility of the EU's foreign policy. The EU is one of China's largest trading partners, and any changes in its trade policy directly affect the Chinese economy. In recent years, there have been fluctuations in the EU's attitude to the EEU with China, which causes even more uncertainty.

However, despite this, China still maintains stable economic relations with Asian countries. Using its geographic location and economic power, China is increasing its influence in the region.

Russia, as a country with a unique economic and political context, also experiences economic policy uncertainty. The main causes of economic policy uncertainty in Russia include:

a) Geopolitical factors: Geopolitical tensions in Russia, international sanctions and strained relations with some Western countries contribute to economic policy uncertainty. These factors create risks and uncertainties that may deter foreign direct investment (FDI) and affect domestic business confidence.

b) Dependence on natural resources: Russia's economy is heavily dependent on natural resources, especially oil and gas exports. Fluctuations in world commodity prices and the volatility of the energy market can create uncertainty and influence investment decisions in the country.

The main challenge for Russia is Western sanctions, which were imposed after the events in Crimea in 2014, as well as new sanctions imposed in 2022. These sanctions have had a noticeable impact on the Russian economy, slowing investment flows and creating difficulties in accessing international capital.

Political instability and the volatility of Russian foreign policy also contribute to the creation of economic uncertainty. In addition, the Russian economy suffers from oversupply in the natural resources sector, which exacerbates dependence on fluctuations in the prices of these commodities on world markets.

A study of the impact of economic policy uncertainty on investment in China and Russia:

The uncertainty of economic policy in China can have a significant impact on investment decisions. Such implications include:

a) Reduced foreign direct investment (FDI): Increased uncertainty can make foreign investors hesitant about long-term capital and resources, resulting in lower FDI inflows. Uncertainty about regulatory changes, market access, and intellectual property protection may discourage foreign investors and impede economic growth.

b) Changing Investment Patterns: Uncertainty may induce investors to move their investments to less uncertain sectors or regions of China, leading to imbalances in investment allocation and potential inefficiencies in resource allocation.

c) Reduced business confidence: Uncertainty can undermine business confidence by influencing internal investment decisions. Uncertain economic policies and regulatory changes can create obstacles for businesses to expand operations or make new investments, inhibiting domestic investment and innovation.

The uncertainty of economic policy in Russia can have a profound effect on investment decisions. Such effects include:

a) A decline in foreign direct investment (FDI): Economic policy uncertainty, combined with geopolitical tensions and international sanctions, may reduce FDI inflows. Investors may take a wait-and-see attitude or redirect their investments to more stable regions, affecting Russia's ability to attract foreign capital.

b) deterioration of the business environment: Uncertainty in economic policy and regulation can hinder business development and disrupt long-term investment planning. Inconsistent policy implementation, changes in regulations, and unpredictable business conditions can discourage domestic and foreign enterprises from making new investments in Russia.

c) Volatility in financial markets: Economic policy uncertainty may contribute to increased volatility in financial markets, affecting investor sentiment and confi-

dence. Fluctuations in exchange rates, interest rates and stock markets may create problems for investors in assessing risk and return, leading to cautious investment behavior.

Economic policy uncertainty has significant implications for investment decisions in China and Russia. Uncertainty can undermine business confidence, hinder domestic and foreign investment, and impede economic growth. Understanding the causes and consequences of economic policy uncertainty is crucial for both policymakers and investors to reduce risks and create a more stable and favorable investment climate. Addressing the sources of uncertainty through transparent policy making, consistent implementation, and improved communication can contribute to a more predictable environment that fosters sustainable investment and economic development in both countries.

3.The impact of economic uncertainty on investment

In recent years, China has undergone significant economic transformation and policy changes. As one of the world's largest economies, its economic policies play a crucial role in shaping the investment landscape. China's economic policy has undergone significant changes since economic reforms began in the late 1970s. The country moved from a centrally planned economy to a more market-based system. Over the years, China has pursued a variety of policies aimed at stimulating economic growth, attracting foreign investment, and promoting innovation. These policies included fiscal measures, monetary policy, industrial policy, and trade and investment regulatory reforms.[8]

In recent years, China has pursued an economic rebalancing strategy aimed at shifting from an export-driven economy to one that focuses on domestic consumption and innovation. This transition has been accompanied by policy adjustments, such as financial reforms, efforts to strengthen intellectual property protection, and initiatives to stimulate high-tech industries and innovative development.

China's economic policy uncertainty is caused by various factors, including policy adjustments, regulatory changes, and political and economic dynamics. This uncertainty can have a significant impact on investment activity.

Economic policy uncertainty can affect foreign investors' confidence and decisions to invest in China. Uncertainty about regulatory changes, market access, intellectual property protection, and trade policy may pose risks and deter foreign direct investment (FDI) inflows. Investors may postpone or curtail their investment plans while waiting for clearer signals from the government on policy direction and implementation.

It can also affect decisions about inward investment. Businesses may hesitate to expand or make new investments in the face of unclear policy directions or regulatory changes. Such uncertainty can lead to reduced investment in key sectors and impede domestic economic growth.

Different sectors of China's economy may experience different levels of exposure to economic policy uncertainty. Industries that are more dependent on government policies, such as those that are heavily regulated or require significant investment in infrastructure, may face greater uncertainty and potential delays in investment decisions. Industries with high-tech or innovative components may also be more sensitive to changes in policy and an uncertain regulatory environment.

Despite the uncertainties of economic policy, there are examples of successful investments in China. Companies that strategically navigated the political landscape and adapted to changing conditions have been able to thrive. These success stories often involve companies that have forged strong partnerships with local organizations, developed innovative products or services, or taken advantage of growing consumer demand.[9]

For example, multinational companies that entered the Chinese market early and aligned their strategies with the country's economic priorities, such as technology transfer or local production requirements, achieved significant success. Companies that have demonstrated flexibility, agility, and a deep understanding of the Chinese market have been able to overcome uncertainty and build successful operations in China.

On the other hand, economic policy uncertainty can also lead to failed investments in China. Companies that failed to adequately assess or adapt to the changing political landscape, underestimated regulatory risks, or failed to develop a clear market entry strategy faced challenges and setbacks.

Examples of failed investments include situations where policy changes disrupted business models, limited market access, or imposed new regulatory barriers. For example, companies that relied heavily on government subsidies or incentives that were subsequently reduced or eliminated faced significant difficulties. In addition, investments in sectors subject to sudden changes in the regulatory environment or increased competition from domestic players faced obstacles without appropriate adaptation strategies.

Russia's economic policy and its stability play a decisive role in shaping the country's investment climate. Russia's economic policy is characterized by a combination of state intervention, strategic planning, and market reforms. The state plays a significant role in key sectors of the economy, such as energy, natural resources, and infrastructure. Various policies are in place to stimulate economic growth, attract foreign investment, and diversify the economy away from heavy dependence on oil and gas exports.

The Russian government has a strong presence in the economy, and state-owned enterprises play an important role in key sectors. State intervention and strategic planning are often used to shape economic development and prioritize certain sectors.

Russia's economic policy is influenced by geopolitical factors and international relations. Sanctions imposed by Western countries, political tensions, and global economic conditions can influence policy decisions and introduce uncertainty.

Russia's economy is heavily dependent on natural resources, especially oil and gas exports. Fluctuations in world commodity prices and the volatility of the energy market can create uncertainty and influence investment decisions.

Economic policy uncertainty can negatively affect the confidence of foreign investors and their decisions to invest in Russia. Sanctions, geopolitical tensions, and unpredictable policies can create risks and deter foreign direct investment (FDI) inflows. Investors may take a cautious approach, postponing or scaling back their investment plans until there is greater clarity and stability in the political environment.

Uncertainty in economic policy can also affect decisions about inward investment. Businesses may hesitate to expand or make new investments in the face of unclear policy directions or regulatory changes. Such uncertainty can lead to reduced investment in key sectors and hinder economic growth.

Economic policy uncertainty can affect different sectors of the Russian economy to varying degrees. Industries that are closely tied to government policy or heavily regulated may face greater uncertainty and potential delays in investment decisions. Industries requiring significant investments in infrastructure or dependent on government support may also be more sensitive to changes in policy and an uncertain regulatory environment.

Despite the uncertainties of economic policy, there are examples of successful investments in Russia. Companies that have carefully navigated the political landscape, forged strong partnerships with local organizations, and adapted to changing conditions have been able to succeed.

Successful investments often involve sectors such as technology, manufacturing, and consumer goods, where companies have identified market opportunities and adapted their strategies accordingly. In addition, foreign investors who have demonstrated a long-term commitment to the Russian market and built strong relationships with local partners have been successful.[10]

Unsuccessful investments in Russia in the face of economic policy uncertainty can occur when companies fail to adequately assess or adapt to the changing political landscape, underestimate regulatory risks, or lack a clear understanding of local market dynamics.

Examples of failed investments include situations where policy changes significantly disrupted business models, created unexpected regulatory hurdles, or faced delays due to political or geopolitical factors. In addition, investments in sectors significantly affected by sanctions or geopolitical tensions, such as finance or defense, may face significant challenges.

Conclusion

Economic policy uncertainty has a significant impact on investment in China and Russia. Both countries face challenges related to the uncertainty and predictability of economic policies, regulations, and reforms. This affects investors' decisions and can have both positive and negative effects on investment activity.

To overcome economic policy uncertainty in China and Russia, better communication between the government and investors, predictable regulation, and transparency in policy decisions and regulatory changes are needed. Stability and predictability of economic policy help to attract investment, promote economic growth, and stimulate business development in both countries.

Overall, effective economic policy management and reduced uncertainty contribute to a favorable investment environment that fosters capital inflows, business development, and promotes sustainable economic growth in China and Russia.

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家庭暴力侵害儿童案件的应对形式
**FORMS OF COUNTERACTION TO CASES OF VIOLENCE
AGAINST CHILDREN IN THE FAMILY**

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注解。家庭暴力是指一名家庭成员对另一名（其他）家庭成员反复实施的违法行为。实际上，它可以采取多种形式，即不一定涉及家庭中的一个伙伴对另一伙伴或其他家庭成员造成身体疼痛。

我们认为，家庭暴力不仅限于配偶造成身体、精神上的痛苦，反之亦然，这种暴力还可以表现为给前家庭成员（前夫等）、祖父母、子女造成适当的痛苦。等 P.

在俄罗斯联邦，虽然有人试图制定相应的法案，但没有专门的法律规范保护公民免遭家庭暴力。然而，今天刑法、家庭法、民法、行政犯罪法和其他一些立法的规定都旨在保护公民免受家庭暴力。

目前，家庭暴力可能采取犯罪形式（即以谋杀、强奸、反复殴打等形式实施），也可能不采取这种形式，但尽管受害者仍然遭受身体上的痛苦。因此，家庭暴力的肇事者除其他外要承担刑事责任和民事责任。

强奸犯行为的理由、绳之以法的程序和制裁措施各不相同。我们认为，重要的是要了解在哪些情况下家庭暴力行为需要具备刑法资格，以及在哪些情况下受害人应利用民法规范来保护自己的利益。

关键词：家庭、家庭暴力、家庭成员、家庭的意义、婚姻、家庭的法律意义、家庭的社会意义。

***Annotation.** Domestic violence is the repeated illegal behavior of one family member in relation to another (other) family members. In practice, it can take various forms, i.e. does not necessarily involve the infliction of physical pain by one partner in the family on another partner or other family member.*

We believe that family violence is not limited to the infliction of physical, mental suffering by a spouse and vice versa, but such violence can also manifest itself in causing appropriate suffering to former family members (ex-husband, etc.), grandparents, children, etc. P.

In the Russian Federation, there is no special law regulating the protection of citizens from domestic violence, although there have been attempts to develop a

corresponding bill. Nevertheless, today the provisions of the criminal law, family law, civil law, the law on administrative offenses and some other legislative acts are aimed at protecting citizens from domestic violence.

At present, domestic violence may take criminal forms (i.e., be committed in the form of murder, rape, repeated beatings, etc.), and not take such forms, but despite the fact that the victim is still physically suffering. Accordingly, perpetrators of domestic violence are brought to criminal liability and civil liability, among other things.

The grounds, procedures for bringing to justice and sanctions for the deed for the rapist differ. We believe it is important to understand in which cases a criminal law qualification of an act of domestic violence is required, and in which cases the victim should use the norms of civil law to protect his interests.

Keywords: *family, domestic violence, family member, significance of the family, marriage, legal significance of the family, social significance of the family.*

It seems that the following forms of family legal responsibility can be called: deprivation of the right to guardianship and residence with minor children; temporary deprivation of parental rights; temporary termination of the mode of communication, visits and spending time of the father (mother) with children or the form in which they should be carried out (for example, by establishing a meeting place); assignment of alimony.

Children and adolescents who have experienced violence and abuse in the family should be provided with psychological assistance. Which, in turn, should be aimed at the possible complete elimination of their consequences and the adoption of measures to stop violent actions. The main goal of psychological assistance is to reduce the negative impact of the trauma experienced by them on their further development, which in turn will prevent the appearance of deviations in behavior and will help to quickly rehabilitate in society.

An attempt at such assistance was made in the Volgograd region, where a set of measures “The World Begins with the Family” is being implemented, aimed at developing a system for ensuring a safe childhood - this is psychological, pedagogical, socio-pedagogical diagnostics and rehabilitation of children and adolescents who have been subjected to cruel treatment and criminal attacks.

In pivotal schools, which are working rooms for emergency psychological assistance in their scientific and methodological educational cluster, there are teachers-psychologists who have mastered specialized training programs for the psychological and pedagogical rehabilitation of children who have been victims of violence, as well as their families. Mechanisms of interdepartmental interaction allow for consulting, diagnostic and rehabilitation assistance. Such programs as

“Peace starts with family”, “Warm house”, “Talk to me, mom” are being implemented to harmonize broken parent-child relationships¹.

In April 2020, the Federation Council suspended work on a law on domestic violence, its development will continue after the end of the coronavirus pandemic. On November 28, 2019, the Federation Council published a draft law on the prevention of domestic violence. The document provides for the creation of a mechanism for protecting the rights of those who have been or are being subjected to domestic violence. The law should ensure the protection of the rights of victims of violence, provide psychological rehabilitation and help with social adaptation. Amendments have been made to establish a ban on approaching, as well as suggesting that beating and harming be classified as domestic violence.

The authors of the bill (for example, O. Pushkin) believe that if the draft had been adopted before the coronavirus pandemic, such an increase in the number of reports of domestic violence would not have been recorded - in conditions of self-isolation, each next violent episode will be more serious in form than the previous one. It is proposed to provide a sufficient number of shelters for victims of domestic violence, as well as to draw up a register of premises and include vacant hotel rooms where victims can stay. Also, the authors of the law ask to oblige the police to immediately respond to any reports of domestic violence, to protect the victims, not the attacker.

Based on the Draft Federal Law No. 1183390-6 “On the Prevention of Domestic Violence”, we will find out what the most common types are.

1) Physical violence - intentional actions of a violent nature that damage the state of health, well-being and (or) physical harm, any other use of physical force in relation to the victim (restriction of freedom in any of its manifestations, coercion to use substances that affect the functioning of the central nervous system and other); attempts of such coercion, and besides this, also a deliberate illegal refusal to meet the basic needs for care, health care, as well as the protection of the victim of violence, unable due to age, illness, disability, material dependence on the aggressor or due to another factor, to protect themselves from violence, which can cause death, damage her physical health or mental state, physical pain, harm her honor and dignity, and in addition to this, individual, psychological and physical development;

2) Psychological violence - deliberate humiliation of honor, dignity and (or) reputation in society, threatening violence against both the victim himself and his spouse, children or other close people, relatives, acquaintances, pets, as well as persecution, seizure of a passport, birth certificate or other identification docu-

¹ Kuchegasheva, P.P. Psychological and pedagogical rehabilitation of children subjected to violence and abuse, as part of the implementation of the complex of measures “The world begins with the family” in the territory of the Volgograd region // Vestnik obrazovanie. 2020. No. 3. P. 78.

ments; coercion by influencing the psyche of the victim to commit offenses and (or) crimes with the help of threats or blackmail, immoral actions that threaten the life and health of the victim, actions leading to a disorder of mental unity, as well as actions that are not accepted in society; intentionally destroying, disabling or withholding property belonging to the victim or their loved ones;

3) Sexual violence is an act aimed at violating the sexual inviolability or sexual freedom of the victim. This includes: exerting pressure to enter into sexual relations, including with the use of force, threats or blackmail, and all kinds of other acts of a sexual nature;

4) Economic violence is the intentional deprivation of a “roof over your head”, food, clothing, necessary medicines, property, money, both cash and non-cash, to which the victim has the right, provided for by the letter of the law; intentional destruction or damage to property; prohibition or creation of barriers in the possession, use, disposal of property that was acquired by joint labor; refusal to provide disabled, dependent citizens; coercion to hard and detrimental labor, including a minor family member, elderly and other members, and any other actions of a similar nature that cause financial difficulties for the victim, with negative consequences².

The Russian Federation cannot demonstrate an abundance of measures aimed at eradicating the phenomenon under consideration, and therefore we propose to consider methods for combating domestic violence using the example of a number of European countries with the subsequent possibility of using them for domestic legislation³.

Violence against a child or abuse by people close to him turns out to be the cause of many psychological problems due to the widespread traumatic effect on the psyche of the child. The consequences of violence can cause disturbances in the emotional, motivational, social, cognitive and behavioral spheres of the child, be both urgent and delayed. They concern not only the victim herself, but also her immediate environment and society as a whole. It is the severity and diversity of the consequences of violence and child abuse that dictates the close attention that is being paid to this problem at the present time.

In modern Russia, there is no developed social service for the prevention of domestic violence and assistance to its victims. At the federal and regional levels, an effective plan should be developed to improve the work of social services and support for victims of domestic violence, to increase the number of crisis centers, of which there are currently about 150 (as well as about 60 church shelters (shelters) for pregnant women and mothers with children who are in a difficult life

² Draft Federal Law N 1183390-6 “On the Prevention of Domestic Violence”

³ Tarasova, L.Ya. On the issue of delimiting the concepts of “domestic violence” and “conflict in the family” // Actual problems of combating crimes and other offenses. 2022. No. 22-2. P. 55

situation) and pay attention to the implementation of programs that contribute to increasing the culture of non-violent behavior in the family. The main direction in the fight against domestic violence is a coordinated system of technologies at all levels, which, for example, includes regularly informing the population and all interested parties through the media about institutions, centers providing various types of assistance (consulting, psychological, legal).

To reveal the features of preventive work with families subjected to violence in the context of family services, it is important to generalize work experience. To do this, we have revealed the features of the activities of the family service for working with families and the prevention of domestic violence on the example of the family service in the city of Birsik, which is a structural subdivision of the State Budgetary Institution of the Republic of Bashkortostan, the Northwestern Interdistrict Center “Family”.

Another important area of work is comprehensive support for families. It is carried out within the framework of social support of the family. Family social support is understood as a set of measures aimed at preventing and overcoming family problems through the involvement of various organizations in the focus of interdepartmental interaction, as well as assisting families in providing various types of assistance.

In the Russian Federation, it is not customary to make domestic violence public, there is no federal law to prevent such violence, official data on children who have experienced violence are not given anywhere, the right of children to protection in our justice system is not ensured, although, according to averaged data from various unofficial sources, in each the fourth Russian family experiences violence.

In recent years, many new institutions have appeared in Russia to help women in need of legal, social, material assistance and protection. If we talk about children, especially from dysfunctional families, then development is still needed in this direction. There is a lack not only of institutions that would solve these problems, but also there is no system for informing children about the possibilities of applying for help.

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关于交通运输业重组和引入数字技术的问题
**ON THE ISSUE OF THE REORGANIZATION OF THE
TRANSPORT INDUSTRY AND THE INTRODUCTION OF DIGITAL
TECHNOLOGIES**

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注解。 该研究探讨了俄罗斯运输业的重组。 现代时期使运输业的革新成为可能。 因为，作为主要平台，在不缩小其应用范围的情况下，它具有应用倡议以及引入发展的所有必要条件，包括将该行业转移到数字平台。 交通质量特征的控制、交通流量调节基地的建设以及预测性维护的全天候监控，不仅需要重新装备技术基础，还需要引进国内最新进展，而且还需要提供移动道路服务来提供客户服务，这在某些地区已经非常见。 针对创新应用存在的问题，在制裁压力的情况下，国内技术阵列中信息化方向的短暂发展应以立法规制为基础。 道路运输行业融资的问题需要公共部门的持续监测和发展。

关键词：民事立法、运输业、监管规定、数字技术、运输控制、质量。

Annotation. The study examines the reorganization of the transport industry in Russia. The modern period makes it possible to renovate the transport industry. Since, being the main platform, without reducing the scope of its application, it has all the necessary conditions for the application of initiatives, as well as the introduction of developments, including the transfer of this industry to a digital platform. The required control of the qualitative characteristics of traffic, the construction of a base for regulating traffic flows, as well as round-the-clock monitoring of predictive maintenance require not only the re-equipment of technological foundations and the introduction of the latest domestic developments, but also the need for the availability of mobile road services for customer service that are already common for certain regions. The existing problems of the application of innovations, in the conditions of sanctions pressure, the transient development of IT directions in the domestic technological array should be carried out based on legislative regulation. Problematic issues of financing the road transport industry require constant monitoring and development by the public sector.

Keywords: civil legislation, transport industry, regulatory regulation, digital technologies, transport control, quality.

The modern development of society is characterized by the digitalization of all spheres of its life. At the same time, cities and centers with a sufficient number of vehicles receive the basis of development. The mass media cover the active transformation of the transport industry and its transition to a new technological level, the creation of intelligent transport systems, and the development of new solutions for the convenience of passengers using various terminals and making travel payments. In some cities, unmanned vehicles for the transportation of goods and passengers, as well as monitoring systems for the maintenance and repair of such vehicles, are being successfully tested. In addition, there is an active introduction of advanced technologies and the creation of domestic electric vehicles, which can already be seen on the roads of Russia. However, the rather high cost of development and their implementation allows such initiatives to be implemented far from everywhere.

The problems associated with the underdevelopment of infrastructure and the insufficiency of regulatory legal regulation have a complex nature and are based on a number of difficulties. The most significant problem is the lack of charging stations. Over the past few years, specialized refueling complexes for electric vehicles have begun to appear in the largest cities of Russia – Moscow, St. Petersburg, Kazan and others, which allow owners to provide the necessary charge. But in smaller cities, the problem with gas stations is still extremely relevant. Even if at least one charging station for electric vehicles is organized in the city, users often complain about the convenience of its use and operability.

It follows from this that it is possible to buy, comfortably operate and maintain an electric car for an ordinary car owner today only in the largest megacities, whereas leaving them will most likely entail a number of worries about charging, since the power reserve that modern electric vehicles can provide varies from 280 to 600 kilometers. Speaking of other operational difficulties, it is necessary to carefully analyze the Russian climatic realities. In winter, the cold will negatively affect the batteries, reducing the mileage on a single charge by 2-3 times.

The construction of new city districts also does not use the scale of architectural thinking and the roadway consists of two to four lanes, instead of the already necessary 6-8. People spend two times a day in traffic jams every day, and during the weekend, nonresident cars pour into the stream, trying to get to relatives and to their own suburban areas. The situation suggests the need to make decisions on changing the transport situation on the roads of Russia. First, the question concerns information resources that could bring transport information to the user, that is, the driver or passenger, in the shortest possible time. Since the time costs relate not only to those who drive the vehicle, but also to persons, for example, traveling to the airport. Therefore, transport modeling, transport analytics, statistics and matrix traffic management come out on top in solving the transport issue. Mod-

ern technologies in the field of navigation and routing, as well as geo-positioning within the use of digital maps and various applications allows you to find the desired vehicle on the road in real time, calculate the trajectory of its movement and calculate the travel time by calculating the flow rate.

Oddly enough, the main providers of geolocation information are users of car and portable navigators, various geolocation applications for smartphones, as well as operator companies. Such a combined set of sources ensures high quality and representativeness of the collected information. It is online that forms the basis for calculating the digital format of the movement of motor vehicles and the traffic flow as a whole.

The relative stagnation of the transport industry and the issues of its transfer to a different format of interaction with the client began during the pandemic period. This time is characterized not only by a sharp decrease in the mobility of citizens, but also by the need for subsidies and subsidies from the state in order to preserve such a service. There was no need to talk about the introduction of any technologies. [1]

However, the gradual lifting of restrictions today allows us to return, practically, to the previous level of traffic based on its intensity. Yet there are still questions related to the epidemiological situation, which has left a certain range of habits to customers – residents in cities. Many people are afraid to use public transport, to get in touch with the conductors when paying for travel and try to either minimize their movements, or do it with the help of taxi services and private vehicles. [2, p. 175]

Yet, the issue of digitalization of the transport industry remains open for now. For the convenience of public transport passengers and minimization of contacts at waiting stations, contactless payment services and online applications are included today, allowing you to track the route and time of arrival at a stop of a tedious type of public transport. However, this is no longer enough today because the following problems of the transport industry remain unresolved: high accident rate due to not only the human factor, but also road and weather conditions; weak efficiency of transportation processes by traditional modes of transport; the remaining low mobility of the population; the inability to carry out operational management of the transport complex from a single management headquarters; poor awareness and low coordination of actions of federal, regional and local authorities, their subjects in ensuring road safety, including transport security and cybersecurity; the inability to monitor the condition of transport infrastructure facilities on at all stages of their life cycle.

In this regard, the Government of the Russian Federation adopted Resolution No. 1922 dated 9.11, 2021 “On Amendments to the State Program of the Russian Federation “Information Society” and Invalidation of Certain Decisions of

the Government of the Russian Federation”. One of the projects of the program was the strategy of digital transformation of the Transport industry, consisting of six directions. Among them, you can see the digital management of the transport system of the Russian Federation, the digitalization of transport security and the solution of issues of digital twins of transport infrastructure facilities. The program is designed until 2030. The interesting thing is that the start of the program is not financially secured.

However, quite interesting are the positions extended to the transportation of passengers and cargo, namely the introduction of drones to move them. Within the framework of the program, this moment looks like this. Creation of infrastructure for the movement of unmanned vehicles of all types of transport, which provides for the commissioning of unmanned vehicles of passenger and freight vehicles, trains, ships, as well as the robotization of transport and logistics hubs (hubs), which include ports, railway stations, logistics centers. Such a transition is planned in connection with an increase in the average speed of transportation, improving traffic safety and reducing transport costs. [3]

In the field of fare payment on any transport, or confirmation of registration and travel, the use of biometric data has started today, to which, for example, the Beac bank links payment services. Therefore, in airport terminals, passenger registration takes place by fingerprint, and travel in ordinary buses and trolleybuses is possible using not only plastic cards, but also security systems and other digital tools. Cameras are already working on toll roads (M11 or CCAD) that calculate the path and give out the fare without contacting the administrator.

However, do not forget about electric cars. The situation on the roads is complicated by the poor development of infrastructure for this type of transport. In the Russian Federation, there is a fundamental regulatory document in the field of motor transport — Federal Law No. 259-FZ dated 08.11.2007 “Charter of motor transport and urban ground electric transport”. Regulation of the area of electric filling stations is not included in it. Such a gap should be eliminated as soon as possible by making changes to the subject of Federal Law No. 259, including electric vehicles and gas stations. Changes in the norms of legislation will create a basis for further filling of the regulatory legal component in the field of electric vehicles and will push the legislator to law-making activities. In the Russian Federation, there is GOST R 58404– 2019 “Filling stations and complexes. Technical operation Rules”, but its provisions also do not cover electric filling stations.

The use of intelligent transport systems is no longer news for the population of the country. They collect information related to roads and the entire road structure. Everywhere, of course, along the main transport arteries of the country, they collect information about the movement of vehicles, speed limits and even about people in cars. This means that there is already a basis for a digital structure for traffic

flow management and improving the safety of transport complex management. In addition, today digital weather stations are being introduced into such a complex to monitor the roadbed and inform traffic participants about the condition of the highway. This unique complex of microsystems captures wind direction, airflow velocity, precipitation and optical visibility, is able to assess the road surface, its temperature, etc.

According to the plans of the Ministry of Transport of Russia, such digital information road ecosystems should be built on the principle of a ladder, that is, from the bottom up: from the municipal to the regional level, and then go to the federal level. At the level of cities and towns, subsystems are being introduced that allow monitoring traffic, informing people about the situation on the roads, monitoring the condition of roads, as well as accepting funds at toll stations.

In addition, data from local authorities are collected at the regional level on an integration platform. This allows you to extract, analyze and distribute information from subsystems and create automatic algorithms based on recurring events. [4] Of all the above, in the regions, most often in reality there are security cameras (speeds) related to the “safe city” system, toll stations, and the notification of repair work comes from the Navigator applications, but with a certain delay or outdated data, when the repair work is already completed, and the navigator reports them, or the work began and a long automobile collapse was formed ahead, which could be avoided, and the information for this came too late.

The solution of transport issues does not stop at the simple digitalization of its services, which are tied to specific people or biometric data “for convenience”, which leads to total tracking not only of a person’s income level, but also of the frequency of his movements and travel directions. The issue of the convenience of using transport today is solved in other ways. One of them is the transition of public transport to the second level. It is assumed that such a system can solve a number of issues related to the capacity during peak hours, minimizing the negative impact on humans and the environment while maintaining the duration of the daily mileage of the vehicle, reducing fuel consumption, since the appearance of an energy crisis on a planetary scale is already beginning to be observed in individual countries, addressing issues of transport security and much more.

Issues of regulatory regulation of the transport sector mainly relate to civil legislation, and since the introduction of new provisions on digital objects of civil rights, issues of digitalization in this area should not arise. But what about the appearance of new types of vehicles and moments of some discrepancy between the levels of security of citizens and issues of secrecy of information about a person and a citizen in order to protect his personal life.

As part of information security, so far the state gives preference to the convenience of citizens, despite, now, the impossibility of hiding access to personal data.

And in the field of solving the transport issue, quite a large number of developments have recently appeared that could attract the attention of investors within the framework of the Information Society program. However, while there are no funds for such developments, and the solution of transport security issues for citizens today is more important than the issues of confidentiality of their income, location and movement, which also requires regulatory regulation. [5]

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山东师范大学赫尔岑国际艺术学院教育环境中俄语教学的实践
**THE PRACTICE OF TEACHING THE RUSSIAN LANGUAGE
IN THE EDUCATIONAL ENVIRONMENT OF THE HERZEN
INTERNATIONAL ART COLLEGE (HIAC) AT SHANDONG
NORMAL UNIVERSITY**

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抽象的。 本文专门介绍山东师范大学赫尔岑国际艺术学院向中国学生教授俄语作为外语的特点。 作为俄罗斯与中国之间的“教育桥梁”，赫尔岑国际艺术学院有助于进一步加强俄语和俄语教育在国外的地位，以及在世界范围内传播赫尔岑国立大学的先进教学经验。 教育空间。 新教育机构的一个特点是其国际性，专注于俄罗斯艺术教育，致力于与俄罗斯建立文化联系。

关键词：对外俄语教学方法、教育环境、教学实践、项目法、教学中的区域研究成分。

Abstract. *The article is devoted to the peculiarities of teaching Russian as a foreign language to Chinese students at the Herzen International Art College at Shandong Pedagogical University. As an “educational bridge” between Russia and China, the Herzen International Art College contributes to the further strengthening of the positions of the Russian language and Russian education abroad, as well as the dissemination of advanced pedagogical experience of the Herzen State University in the world educational space. A feature of the new educational institution is its internationality, focus on Russian art education, on the creation of cultural ties with Russia.*

Keywords: *methods of teaching Russian as a foreign language, educational environment, teaching practice, project method, regional studies component in teaching.*

Currently, Russian-Chinese cooperation in the field of education is actively developing, with special attention being paid to higher education. The relevance of this direction is due to the fact that for further effective strategic partnership between Russia and China, it is necessary to train specialists for the implementation of joint projects in various areas of cooperation. In this regard, joint Russian-Chinese educational programs and joint educational institutions have been opened in recent years.

In 2022, Shandong Normal University (China) received approval for the implementation of a new educational project – Herzen International Art College (HIAC SDNU). The creation of the College involved the introduction of advanced concepts of art education and educational resources of the Herzen State Pedagogical University of Russia into the international space and was the result of close cooperation between the two universities [10]. Thus, the College is a “window” into the Russian educational system for future graduates of the College: “teachers of basic education” and “senior research specialists”, that is, teachers and research teachers in art education. Of course, HIAC SDNU provides the state tasks of China – support for young talents, support for the economic and social development of Shandong Province, as well as the presidential initiative “One Belt – One Road”.

In the fall of 2022, the Institute successfully accepted its first students in three bachelor’s degree programs in music, choreography and fine arts, as well as two master’s degree programs: Master of Arts (Music) and Master of Arts (Fine Arts). The peculiarity of the educational institution that has emerged is its internationality, orientation towards Russian art education, and the creation of cultural ties with Russia.

The student training program includes annual student exchanges, master classes, conferences, joint events, concerts and exhibitions. Already now students are preparing for a summer school in St. Petersburg, which will be held on the basis of the Herzen State Pedagogical University. Many HIAC undergraduate students plan to continue their studies in master’s and postgraduate programs in Russia. Russian is certainly necessary for students to study in Russia, so the discipline “Russian as a foreign language” is mandatory for students.

Teaching in a non-linguistic environment has its own difficulties: it is necessary to take into account a different education system with its own characteristics, a control system, cultural differences (Chinese culture requires compliance with certain rules, like any other, and is “closed”), logistics, etc. To this it is necessary to add a completely different motivation of students. If in Russia a foreign student needs the Russian language “vitally”, then in China a student focuses on using the language in future activities. The teacher is faced with the task of creating “subjective” motivation [2], encouraging interest in Russian culture and its famous representatives, to Russian people. The living language environment is being replaced by a lot of educational and technical manuals, access to the Internet, etc.

How to make up for the lack of a language environment? This task is most relevant for a visiting foreign teacher. O.P. Bykova emphasizes [3] that the main difference between teaching in a non-linguistic environment is that the text becomes the main unit of learning, while in a linguistic environment such a unit is discourse. An attempt to solve this problem was made in the textbook “In Russian in St. Petersburg” [5], prepared at the Department of Intensive Training of the Russian Herzen State Pedagogical University.

The main value of this textbook is numerous authentic audio tasks that introduce the necessary discourse into the classroom and independent classes of students and allow avoiding normativity, some limited knowledge that students are forced to face in a non-linguistic environment. We also note that “the cultural component in the textbook contributes to the strengthening of the motivation of foreign speakers to learn the Russian language” [6, p. 344].

The long-term teaching practice of the Intensive Training Department of the Russian of the Herzen State Pedagogical University has allowed us to develop a certain style of educational and cognitive activity, which is necessary for Chinese students as a kind of ethnogroup. We will list only a few important methods of work: a large amount of training exercises; practical teaching of grammar; semantics of vocabulary through interpretation or translation; visualization of material at any opportunity; multiple listening to audio material; taking into account the interests of Chinese students when selecting material for reading and conversational practice; knowledge control through written tests, constant repetition and review of the material passed, independent exercises with keys, etc.

HIAC students study a large amount of special subjects in painting, music, and dance. A necessary condition for preparing foreign students to study at Russian universities in Russian is their familiarity with special vocabulary related to future professional activities. For this purpose, manuals on the specialty language for musicians and artists prepared by the Department of Intensive Training of the Russian of the Herzen State Pedagogical University are used [1, 4], since traditionally the majority of students entering the preparatory department of the Herzen State Pedagogical University are musicians, choreographers and artists.

In order to satisfy the professional and cultural needs of students to the greatest extent with a relatively small number of hours in the Russian language (12 hours per week), it is advisable to use the project method, which provides “an active, interactive and developing nature of the educational space” [7, p.249]. A successful example of project activity is the presentation of students in Russian about their university, their hometown, etc.

The regional component plays an important role in teaching Russian to foreign speakers. One of the effective methods of work that allows foreign students to successfully combine the study of language and culture is the online excursions

“Cultural Space of Russia”, which include the richest material: “Ancient Kremlins of Russia”, “Images of Ancient Russia in Painting, music and theater”, “Moscow is the capital of Russia”, “Russian Book Culture”, etc. The volume and content of cultural studies materials are related to the education of Chinese students in Russia in the conditions of St. Petersburg. Comprehending the cultural and historical space of the Northern Capital, they get acquainted with its architecture, museums and palaces, as well as with the most famous architects and sculptors of St. Petersburg and its suburbs [9]. Of course, information about the North-Western region of Russia is relevant for Chinese students, since “by learning the culture, traditions, and history of the region, they learn the cultural realities of the country as a whole through the region” [8, p.90].

Extracurricular work (joint holding of holidays, contests, discussions, etc.) activates the learning process, making it creative, lively, increasing students’ interest in learning Russian.

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利用互联网技术准备特殊科目ESP课程的实践课程
**PRACTICAL CLASSES ON THE PREPARATION OF THE
ESP COURSE IN SPECIAL SUBJECTS USING INTERNET
TECHNOLOGIES**

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注解。 本文对ESP(特殊用途英语)课程进行了分析,该课程是目前高等教育机构外语教学的渐进式课程之一。 本研究被认为是一个机会,基于理论分析和实验研究的结果,找到解决改善语言训练问题的主要科学方法,以确定在高等职业教育中进一步解决这一问题的方法。 文章根据语言培训的具体任务和专业,以及商业环境的不断变化和当前对外语知识的要求,讨论了教材的选择和进一步的适应。 研究结果是,ESP 课程应根据学生的需求量身定制,重点关注生产技能、专业词汇和跨文化能力。 该研究还讨论了在全球化框架内不断变化的现代经济大学的多学科环境背景下提高专业能力的途径和方法。

关键词: 商务英语、学生需求、在线学习、适应、商务环境、特殊用途英语。

Annotation. *This paper analyzes the ESP (English for Special Purposes) course, which is currently one of the progressive approaches in teaching a foreign language in a higher educational institution. This study is considered as an opportunity to find the main scientific approaches to solving the problem of improving language training, based on the results of theoretical analysis and experimental research, to identify ways to further address this issue in higher professional education. The article discusses the selection of material, its further adaptation in accordance with the specific tasks of language training and specialty, as well as ongoing changes in the business environment and current requirements for knowledge of a foreign language. The result of the study is that the ESP course should be tailored to the needs of students focused on productive skills, specialized vocabulary and intercultural competence. The study also discusses ways and methods that can increase professional competence in the context of the multidisciplinary environment of the modern economic university, which is undergoing constant changes within the framework of globalization.*

Keywords: *business English, students' needs, online learning, adaptation, business environment, English for special purposes.*

A review of current publications shows that a particular difficulty today is the problem of integrating theory and practice in the process of online education, which was not considered so sharply in the pre-Covid learning process. It would be better to start by defining the phrase Business English is a language that is very closely related to international trade. It is part of the “English for Specific Purposes” (ESP) and can be considered as one of the important areas in the study and teaching of English.

Most experts believe that business English includes most of the characteristics of the ESP, such as: characteristics of the analysis of student requirements, course structure, course structure, selection and adaptation of materials that relate to the entire level of the ESP. [4, 16-17] .

Similarly, “Business English includes a specific language structure and emphasizes specific types of communication in a specific context.” However, Business English differs from ESP due to the combination of specific content and general content. ESP is more focused on specialized vocabulary, in particular, design, logistics, tourism, marketing.

Thus, the following questions arise that teachers of the discipline of business English face in their profession:

- Do I need to pay special attention to professional and thematic vocabulary or only communication skills?
- How to prepare a Business English course that would meet the expectations and needs of students as much as possible?
- Which teaching and learning methods are more suitable for a business English course for students of economic specialties?

The authors will try to answer some questions based on the practical experience of teachers of the faculties of Economics of Plekhanov Russian University of Economics. It is generally accepted that students studying economics and business should study the language of the specialty, vocabulary and have certain skills. Curriculum for students of Plekhanov Russian University of Economics includes two semesters of foreign language teaching in the form of a practical course. Further, as for the components and elements of the foreign language learning process involved in the structure and content of the business course for students of economics faculties, the following aspects are taken into account: the content of the course, the language skills of students, a glossary, as well as the level of teacher training. Unlike General English, the specifics of a Business English course are based on a number of specific steps and tasks, such as:

Analysis of needs: what are the goals and requirements of students to fulfill the requirements of future career growth; Level testing: individual conversations, the

fulfillment of some questions, written tests to determine the level of students at the beginning of the course;

Training according to the curriculum: a training course that includes additional tasks;

Course objectives: should be directly related to the results of the needs analysis; in the case of students of the initial level of the language, their goals are determined in terms of the course of study and the need to improve language competencies;

Time: the course must be structured by semester or number of hours;

Exams: Students of Business English will be more focused not only on their requirements, but also on their own, and students at the initial level of the language may have deeper requirements that will be mainly focused on their requirements.

Materials: should be identified and selected depending on the level of students; they may be existing business courses, most often with a large number of adapted materials or non-adapted texts;

Methodology: the role of teachers is an expert in business and foreign languages, and they should establish proper communication with them, trying not to use authority in front of experienced students;

Efficiency improvement: through written or published testing, identification and evaluation of professional knowledge of the material.

In general, all these steps and goals were very useful and effective in developing a common economic program for all students of economics, regardless of their specialty. Consequently, students had the opportunity to narrow their language skills and professional vocabulary only in the last years of their studies, focusing on specific areas in which they work after graduation (marketing, design, tourism, etc.) [3].

However, the higher education system has undergone a number of changes in the context of globalization and digitalization in all spheres of society - in the economic, political, educational and medical fields. In this regard, based on the requirements and development of world educational systems, Russian universities also had to change and develop business English courses using online technologies in order to meet the expectations and needs of not only Russian, but also foreign students.

Do not forget that aspects of the business of the English language are constantly changing and developing depending on the development of global economic cooperation, globalization and the expansion of student exchange programs at universities. Changes in language could already be seen in textbook materials since the 1980s, which placed more emphasis on communication skills (speaking, reading, writing, listening) in a business context [6, p. 53].

Business English is now more focused on functional areas such as negotiation

language, advice, agreement or disagreement, advice, expression of opinion, presentation techniques, meeting skills. Therefore, the practical use of the language is sometimes hindered by theoretical knowledge of the language.

Who is learning business English and what are their needs? Another important distinction made by experts is that business English students can be both advanced students and beginners [5, 226-227]. Each group of students has its own basic language abilities, needs and expectations. They differ in their level of business knowledge or experience and motivation.

Thus, students studying economics can be considered students with practical skills and they have special needs according to their level of English and language requirements related to their future profession or job. Beginner students seem to be more motivated than advanced students, but they definitely lack confidence in their business knowledge. Thus, teachers here act as experts who teach not only a foreign language, but also provide basic adequate information on the subject of business.

Regardless of this development, most scholars share the view that the structure of teaching business English should be fairly generalized, as they suggest that students of economics first need to acquire a general knowledge of business English, covering communication skills that help to establish contact with others. people in a foreign language, correctly interpret their speech, behavior and adequately respond.

Communication skills are important for various professions of journalism, psychology, sales, acting and business, where communication with others occupies the status of artistic or communication ability. [1, p. 12-13].

At present, information technologies are being actively introduced into the educational process of modern universities, as well as into the teaching of foreign languages. Practice of the Russian University of Economics named after G.V. Plekhanov proves that today it is possible to use the following information technologies in teaching: educational platforms that allow you to organize electronic courses offline; practical training in real mode through online conferences; free educational sites and applications where teachers can create tests, handouts and use them in the learning process and knowledge assessment.

The use of information technology undoubtedly evokes a lively response from students and increases their motivation for learning. The use of information technology can also help improve students' language skills. However, according to the results of student surveys, 100% transition to distance learning loses to learning with partial use of information technology, which cannot but please teachers. Thus, information technologies have a fairly rich potential in the study of foreign languages, and their use is aimed at achieving the goal of teaching foreign languages in general.

This review article attempts to present some specific aspects and problems in teaching business English on Internet platforms. The main problems are related to global changes in the system of higher education, new requirements for the development of curricula and the content of practical courses for students studying English at economic universities [2].

Most teachers support the need to focus mainly on the functional language, that is, the language of the specialty. However, in order to meet the needs and requirements of students, constant changes are needed, and the course content should be supplemented with more effective methods (online projects, conferences, business cases) in order to prepare future highly qualified economists working in the global business environment.

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从小学一年级教学视角——幼儿园与小学衔接数学教育的现状与对策研究
**FROM THE PERSPECTIVE OF FIRST GRADE TEACHING IN
PRIMARY SCHOOL - RESEARCH ON THE CURRENT SITUATION
AND COUNTERMEASURES OF MATHEMATICS EDUCATION IN
THE CONNECTION BETWEEN KINDERGARTEN AND PRIMARY
SCHOOL**

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抽象的。近年来，与幼儿期和小学过渡相关的问题一直受到教育工作者的关注。过渡教育直接影响新生入学后的适应能力和后期发展，也影响教育领域专业教学质量的提高。幼儿园和小学是一个具有连续性和周期性的综合系统。学龄儿童从幼儿园到小学必须逐渐适应学校教育，是心理和行为习惯的重要过渡期。如今，绝大多数有关中小学衔接的问题都是从幼儿园的角度来研究，忽视了小学一年级中小学衔接的教育教学。幼儿园与小学的衔接是一个双向问题，不仅需要关注幼儿园教育，还需要从小学一年级的教学入手，进行研究。数学作为一门非常重要的基础学科，具有高度抽象、严密逻辑的特点，决定了在转型初期需要采取分步实施的方式。

本文从小学一年级教学入手，考察学前数学教育的有效性。本研究以东台市第一小学为例，观察学生数学入学第一学期的课堂表现和学业评价，提出合理的一年级数学教学策略，以提高学生小学数学学习的学习效率和主动性。

关键词：幼儿园与小学衔接； 一年级数学教学； 幼儿园与小学衔接的教学策略。

Abstract. *In recent years, issues related to the transition between early childhood and primary school have been of concern to educators. The transition education directly affects the adaptability and later development of new students after enrollment, and also affects the improvement of professional teaching quality in the field of education. Kindergarten and primary school are an integrated system with continuity and periodicity. School-age children from kindergarten to primary school must gradually adapt to school education, which is an important transitional period for psychological and behavioral habits. Nowadays, the vast majority of issues related to the connection between primary and secondary schools are studied from the perspective of kindergartens, neglecting the education*

and teaching of the connection between primary and secondary schools in the first grade of primary school. The connection between kindergarten and primary school is a two-way problem, which requires not only focusing on kindergarten education, but also starting from the teaching of the first grade of primary school and conducting research. Mathematics, as a very important fundamental discipline, has the characteristics of high abstraction and strict logic, which determines the need to adopt a step-by-step approach in the early stages of transition.

This article starts with the first grade teaching in primary school, and examines the effectiveness of preschool Mathematics education. This study takes Dongtai First Primary School as an example to observe students' classroom performance and academic evaluation in the first semester of mathematics enrollment, and proposes reasonable first-year mathematics teaching strategies to improve students' learning efficiency and initiative in primary school mathematics learning.

Keywords: *Connection between kindergarten and primary school; First grade mathematics teaching; Teaching Strategies for Connecting Kindergarten and Primary School.*

1. Analysis of differences between young and young children

The transition between kindergarten and primary school is a smooth transition between the two levels of education, and it is also a very important turning point in children's growth process. This stage is the second transitional period among the three environmental changes that people must experience when shaping and using logical thinking. The transition between kindergarten and primary school has long been a concern for educators and has also caused anxiety among parents of pre-school children. But the problem has not been solved well all along. In kindergarten, education is mainly focused on games and skills, while in primary education, formal homework and static knowledge learning are the main focus. The difference between the two educational methods requires children's physical and mental adaptation, which is the main task in the transition stage from early childhood to early childhood. If a child transitions improperly in the early stages, it can lead to various problems in their physical, psychological, and social adaptability. The negative reaction to the body is that children are prone to loss of appetite, fatigue, poor mental status, excessive Psychological stress, inferiority complex, learning fatigue and poor social adaptability. It can lead to their withdrawn personality, not being good at talking to others, and not daring to communicate with classmates. These issues will have a significant impact on children's future lives. Therefore, it is very important to attach importance to the connection between young and young children, but it is necessary to grasp a certain degree, neither to ignore it, nor to act on behalf of others, nor to increase children's physical and mental burden, nor to stifle their interest in learning.

2. Problems in the connection between kindergarten and primary school

(1) Less communication among teachers in early childhood

It is understood that many kindergartens attach great importance to the connection between kindergartens and primary schools, actively carrying out pre school preparation work for children, while most primary schools rarely consider the physical and mental development characteristics of newly enrolled children, which leads to a one-way connection between young children and primary schools. Although some schools have recognized the importance of combining kindergarten education with primary education, they actively establish connections with kindergartens, such as inviting kindergarten teachers to attend classes in primary schools, observing and improving communication between primary school teachers and kindergarten teachers. However, most schools still follow the traditional way of education, without actively communicating with kindergartens in mathematics subjects, and rarely considering the physical and mental development characteristics of new students, which may lead to new students not adapting to mathematics learning after enrollment. Therefore, in the transition between pre-school and primary education, communication between primary school teachers and kindergarten teachers is crucial.

(2) Inadequate clarity in mathematics teaching objectives during the transition from kindergarten to primary school

In most preschool education institutions, teaching objectives mostly overlook the cultivation of mathematical thinking and learning interests, with the goal of teaching students mathematical knowledge in advance and improving their mathematical skills. Today, the frequent occurrence of “primary school education” in preschool education is essentially a neglect of the characteristics of children’s physical and mental development, leading to the emergence of “cramming” teaching methods. It is very important to try to avoid the occurrence of “primary school ization” in early childhood education during the transition process between early childhood and primary school. In kindergarten mathematics teaching, there is no clear goal, and most kindergarten teachers are also confused and spend too much energy teaching mathematics, which is a lot of repetition with elementary school mathematics. At present, although some public primary schools are studying the direction of early childhood transition education, they are only in the exploratory stage and there are no clear guidelines yet.

(3) Lack of Rationality in the Selection of Curriculum Content for the Connection between Preschool and Primary Mathematics education

Some primary and secondary education institutions and parents believe that learning elementary school textbooks in advance can alleviate the learning pressure after enrollment, which means that they are fully prepared for enrollment. Therefore, the selection of teaching content lacks rationality.

Mathematics has a high degree of applicability, abstraction, rigor, and logicality. It is a fundamental discipline with high requirements for students' ideological quality. In primary school, it is particularly necessary to master basic computational skills and flexibly use mathematical methods to solve problems, which requires students to have good observational skills and deeper problem-solving abilities. Therefore, students should be prepared for the thinking development of children in the early transitional stage, rather than just memorizing knowledge. We should guide students to learn how to learn and think, cultivate their "listening, speaking, reading, and writing" abilities in mathematics learning, and fully leverage the role of "teacher guidance".

(4) The organizational form of mathematics classroom teaching in kindergartens and primary schools is too monotonous

The teaching organization form for the transition between primary and secondary schools is currently mainly based on the teaching style of primary schools, with a relatively simple organizational form. The classroom teaching of primary school mathematics is mainly conducted through collective teaching. The teachers are teaching on the podium, and the desks and chairs in the classroom are arranged in an orderly manner. In kindergarten, students often choose to sit together or teach in groups, which makes communication between teachers and students more close. Sudden changes in the teaching environment can lead to psychological dislocation among students. Therefore, in the transitional stage from early childhood to primary school, it is necessary for students to gradually adapt to the changes in the organizational form of classroom teaching. This cannot be achieved overnight and should follow the characteristics of children's physical and mental development. Pay more attention to creating a teaching environment, pay attention to students' classroom participation, and stimulate students' interest in learning.

In terms of learning time, a 40 minute elementary school class has strict discipline requirements, and students have very clear learning tasks, which is a challenge for newly enrolled students. If the classroom organization is monotonous, it may lead to students becoming restless and falling into a state of inattention. In the transitional stage, it is necessary to allow students to gradually adapt to teaching time, carry out rich teaching activities such as counting sticks and drawing pictures, fully mobilize students' enthusiasm, and avoid situations where students are not paying attention. Encourage and guide students to conduct independent exploration, prepare for knowledge and skills, and achieve a smooth transition from kindergarten to primary school.

3. Strategies and suggestions for connecting mathematics education between primary and secondary schools

(1) Adjustment of educational policies

Currently, the national education policy does not attach enough importance to the connection between primary and secondary education. Only in the "Guidelines

for Kindergarten Education (Trial)” released by the Ministry of Education in 2001 did it mention that kindergartens should work closely with families and communities, and be connected to primary schools. However, there are no relevant rules for the connection between primary and secondary schools, resulting in insufficient connection between primary and secondary schools in the first grade of primary school. The connection between kindergartens and primary schools is not only an important task for kindergartens, but primary schools should also pay attention to its importance. It is also necessary to pay attention to the connection between kindergarten and primary school Mathematics education. There has always been no unified version of guidelines or textbooks regarding the selection of connecting textbooks for primary and secondary education. Primary schools should actively explore the connection between young and primary Mathematics education under the conditions allowed by the policy, and find the teaching methods and methods that are most suitable for children at the age of connection between young and primary. Teachers should attach great importance to the development of curriculum resources and creatively carry out the work of connecting preschool and primary education.

(2) Integration of primary and secondary school teachers

Kindergarten teachers have limited experience in primary education and teaching, and they also lack experience in kindergarten education and teaching, which makes it difficult to grasp and judge the educational goals and directions of connecting kindergarten and primary school. Therefore, the teaching staff of mathematics preschool education should be more specialized, committed to studying the physical and mental development characteristics of children, and optimizing the educational methods for connecting mathematics with early childhood. Primary schools should actively communicate with kindergartens, strengthen cooperation and communication between primary school teachers and kindergarten teachers, and work together for mathematics teaching in the transitional stage between kindergartens and primary schools.

(3) Adaptability of Strategies and Organizational Forms for the Connection between Kindergarten and Primary School Mathematics Teaching

Students exhibit different physiological and psychological characteristics in kindergarten and primary school, with games being the dominant factor in kindergarten, while in primary school, they shift towards learning as the dominant factor and formal classroom models. In the transition of mathematics teaching between kindergarten and primary school, students should gradually adapt to changes in learning methods. Unifying early childhood teaching methods and establishing transitional learning links can help students alleviate their current lack of adaptation. In terms of teaching strategies, respect the individual differences of students, engage in different forms of mathematical activities, learn by playing, play

by learning, and offer more hands-on courses to cultivate students' mathematical thinking ability and make them enjoy mathematics. Regarding the organization of the curriculum, it is necessary to combine game teaching in kindergartens with teaching in primary schools, so that students can experience the joy of learning mathematics, feel the joy of success, and smoothly complete the psychological transition of learning.

After entering the first grade of elementary school, mathematics courses attach great importance to cultivating students' abilities to recognize, write, and read numbers, emphasizing a shift from concrete thinking to abstract thinking. During this important period, students' abstract logical thinking developed rapidly. Therefore, teachers should adjust their learning progress when teaching mathematics. Teachers can use intuitive courses for students to see, touch, and count, establish concrete thinking, and abstract their understanding of numbers. When teaching simple addition and subtraction calculations, it is necessary to consider various teaching methods, such as counting with a small stick and dividing by one point, to help students understand mathematical reasoning.

(4) Creating a relaxed and harmonious learning environment and atmosphere

In the process of the connection between children and children in mathematics, teachers should give full play to the positive role of the learning environment, make full use of every wall and every corner of the classroom, display students' mathematical learning achievements, insert students' favorite mathematical graphics, write common Mathematical notation, etc., create a learning environment full of children's interests, and alleviate their Psychological stress and discomfort in the school learning process. When placing tables and chairs in the classroom, the seating arrangement should be changed from one row to one row, semi circular, freestyle, etc., to make communication between teachers and students, as well as between students, more intimate in the classroom.

In short, from the perspective of first grade education in primary school, the connection between mathematics and early childhood is beneficial for students' learning, and can also help them achieve a psychological transition from kindergarten to primary school, promoting the development of students' thinking skills. The ability of students to observe, discover, and flexibly use various problem-solving methods can effectively improve their attention. After a semester of observation, both in terms of classroom performance and academic performance, young and primary school transition students have shown significant learning advantages. The education of mathematics early childhood connection promotes students to adapt to the new environment faster after enrollment, increases their interest in mathematics learning, and is beneficial for future mathematics learning, which fully confirms the effectiveness of mathematics early childhood connection.

Although there is still room for improvement in the integration of mathematics education between primary and secondary schools, the overall benefits outweigh

the disadvantages. It helps students develop good mathematical learning habits, develop mathematical thinking, cultivate interest in mathematical learning, and adapt to the mathematical learning mode of primary school more smoothly and faster after enrollment, thus laying a foundation for future mathematical learning

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新加坡式英语短信中的语言偏差（基于新加坡国立大学短信语料库）
**LINGUISTIC DEVIATIONS IN SINGLISH SMS (BASED ON THE
NUS SMS CORPUS)**

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抽象的。 本文概述了新加坡式英语短信中的词汇和句法偏差。 以新加坡国立大学短信语料库2004年和2012年的短信作为分析的基础材料。 英语在新加坡发挥着关键作用，因此，由于语言变体的影响，词汇和句法层面可能发生的变化变得值得研究，这可以作为影响语言认同的有力工具。 结果发现，词汇（省略元音和不可发音的字母）和句法（省略撇号和单词之间的空格）级别的不同类型的省略是 NUS SMS 语料库中 SMS 所特有的。 由于辅音的顺序，省略的字母可以很容易地恢复，并且可以通过其含义来理解被压缩的单词。 因此，可以得出结论，词汇和句法压缩不会改变单词的语义，也不会导致其误解。

关键词：短信、语料库、英语、新加坡式英语、词汇和句法压缩、民族认同。

Abstract. *The article provides an overview of the lexical and syntactic deviations in Singlish SMS. The messages of 2004 and 2012 from the National University of Singapore SMS corpus were taken as the basic material for the analysis. English plays a key role in Singapore, and therefore possible changes at the lexical and syntactic levels become worthy of study due to the impact of the language variant, which can serve as a powerful tool for influencing language identity. As a result, it was found that different types of omission at the lexical (omission of the vowels and unpronounceable letters) and syntactic (omitting apostrophe and space between words) levels are specific for SMS from the NUS SMS corpus. The omitting letters can be easily restored due to the sequence of consonants and the words which are compressed can be understood by their meaning. Thus, it may be concluded that lexical and syntactic compression does not change the semantics of a word and does not lead to its misunderstanding.*

Keywords: SMS, corpus, English, Singlish, lexical and syntactic compression, national identity.

Being the main language of socio-economic development English plays an important part in Singapore. Firstly, in order to make Singapore's ethnolinguis-

tic diversity more manageable, the state divides the population into four ethnic categories: Chinese, Malays, Indians and “others”. It is taken for granted that the members of the major ethnic groups can be easily identified by a combination of historical factors such as linguistic affiliation, cultural customs and racial characteristics. Because of such cultural and linguistic heterogeneity of the population, the State actively encourages English language proficiency by establishing it as a means of teaching in the education system. At the same time, the emphasis is on the perception of this language as ethnically neutral, so that the distribution of economic benefits does not increase in favor of any particular ethnic group, since this circumstance may contribute to the development of interethnic tension. As a result of the measures taken, most residents consider English to be ethnically neutral, but it is obvious that it is not socially neutral. People who speak “good”, “standard” or “proper” English are more likely to come from affluent families, have higher professional qualifications and are more likely to get a good job. In this regard, in Singapore, one can observe certain class differences between the English language of the ‘rich’ and the ‘poor’.

Secondly, English performs the functions of the lingua franca. It is necessary to ensure interethnic communication so that different ethnic groups do not separate from each other, since ethnic segregation can have extremely negative consequences. But, in fact, interethnic communication often uses languages that are not approved by the state or are not recognized by society as a whole. For example, during military service (national service), which is mandatory for the male population of Singapore, young people of different ethnic and socio-economic backgrounds communicate closely, being in absolutely equal conditions, so that they quickly adapt to each other and, in order to offset possible differences, try to avoid the “standard” / “correct” English in favor of the Singaporean version, the so-called Singlish (Colloquial Singapore English, which is not approved by the state), or in favor of one of the Chinese dialects, such as Hokkien, which, unlike the Mandarin, also has no official recognition. It is obvious that the State correctly understands the role of language as a link between ethnic groups, but there is probably an insurmountable gap between the language that is welcomed by the State and the language that can function most effectively among the population.

Thirdly, English is essentially ‘a non-Asian other’, the term used by L. Lim, and therefore it cannot be given the status of the official native language. Singapore cannot do without English, since such an attempt would mean exclusion from participation in global economic transactions with predictable catastrophic consequences that is why Singapore’s language policy is bilingual. At the same time, the country cannot allow the use of only English, as this will indicate the Singapore population’s agreement with the key role of Western language in the politics of local identity, whereas this role should be assigned only to mother tongues. As a

result, the country's language policy is structured in such a way that both English and native languages (Chinese, Malay, Tamil) are considered equally important, albeit for different reasons. This situation is a reflection of the highly politicized status of English. No ethnic group has the opportunity to claim the monopolization of English, since the language must serve the whole country. As an official language, English is valuable because it provides access to technological and scientific knowledge, which helps to maintain Singapore's economic competitiveness in the global market. Of course, English can serve as a lingua franca, but Singaporeans, as a rule, do not identify themselves with it [Lim, Pakir, Wee, 2010: 72-73].

In a survey conducted by Sh. Harada among students, there are different opinions according to which Singaporeans claim that they prefer to speak Singlish rather than standard dialect of the English language (British):

- "What is good English? And who defines what it is? The British, the Americans, the Indians? I believe none can make that claim. Language is something on which no one has a monopoly. I don't think anyone cares whether you mouth a "lah" or a "lor"...Let's not obsess over the English our youngsters speak. And let's not have an inferiority complex—our English is not that bad" [Harada, 2009: 77];

- "Language gives identity. A people's common language is their pedigree—their line of ancestry. That is perhaps why Singlish is so important to Singaporeans...The beauty of Singlish lies in it being so succinct. Its ability to convey meaning so economically makes it too practical a tool to eradicate...Speaking Singlish is a proclamation of who we are and where we feel we belong. Should the day come when the "leh" and "meh" finally disappear from our speech, I wonder if Singapore can be said to exist" [Ibid.: 78];

- "I LOVE Singlish so much, I speak it at every opportunity... It is the language that defines our identity and connects us to our community. Speaking Singlish is a means of survival here, a way of communicating effectively with the people around you. It is even more important at home. Many young people of my generation cannot speak dialect. So, the next best alternative is to use Singlish with our parents and grandparents...It is almost impossible to eradicate Singlish from our lives. And since we can't live without it, we should learn to use it in the proper context. That means we need to be able to code-switch effectively between English and Singlish. Singaporeans are pretty adaptable. At McDonald's we say "Takeaway, please", but at the hawker centre a simple "Tah pau, hor!" does the trick" [Ibid.].

The main goal of our study is to analyze Singlish SMS and then to clarify the techniques of lexical and syntactic deviations applicable in these texts. Therefore in order to conduct the survey SMS from the National University of Singapore corpus were taken as the main research material. The NUS SMS corpus was devel-

oped by Tao Chen and Min-Yen Kan, the researchers from the school of Computer Science at the National University of Singapore. This corpus presents the collections of SMS in English and Chinese, received from the adolescents aged from 18 to 25 y.o. These collections had counted 55,835 SMS in English, including 10,117 SMS received in 2004, and 31,205 Chinese SMS by September, 2014 [8, accessed 20.02.2023] (figure 1).

```
<message id="843"><text>Yup ok... I noe, surprised u still remember... u sleep earl
<message id="844"><text>u takin bus or drivin?</text><source country="SG"><srcID>11
<message id="845"><text>ok...</text><source country="SG"><srcID>110</srcID></source
<message id="846"><text>Yup i eat w u... My sis dun wan 2 eat...</text><source cour
<message id="847"><text>i&apos;m in school now already...</text><source country="SG">
<message id="848"><text>ok then c tmr can eat lunch tog a not lor... Dun disturb u
<message id="849"><text>Multi-tasking... watching tv n writing programs... U going
<message id="850"><text>u bathe already?</text><source country="SG"><srcID>110</src
<message id="851"><text>wow they really can buy...</text><source country="SG"><srcID
<message id="852"><text>Y good, it&apos;s bad... I dun wan 2 get hooked on u... I&
<message id="853"><text>No u din. Hee. I was jus jokin. No need lar then all e more
<message id="854"><text>Yes u did... Then u going office tmr a not? U got sch at 9
<message id="855"><text>u scold me... Aiyo y u so poor thing today... wat time ur
<message id="856"><text>u work until v late today? U got go 4 tut today? Aft tmr ev
<message id="857"><text>Reading e papers lor...</text><source country="SG"><srcID>1
<message id="858"><text>Pick u up at arts or wat?</text><source country="SG"><srcID
<message id="859"><text>My dad said dinner will b ready at 6... So c wat time u war
<message id="860"><text>A bigger size bed doesn&apos;t mean it wont break.</text><
<message id="861"><text>Dun put words into my mouth, i din say dat. No matter wat l
<message id="862"><text>who says i&apos;m sleeping on ur king size bed... Reach hon
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Figure 1. The format of SMS presented in the NUS SMS corpus in 2004

Tao Chen and Min-Yen Kan explain that the collection of the NUS SMS corpus in 2004 was carried out in three technically different ways.

1. Sending SMS messages to the website in the form of a regular transcription. The essence of this method was the complete preservation of the original messages, including spelling, spaces and emoticons.

2. Direct transmission (forwarding) of messages from the phone to the case, for which users needed to save messages in the phone's memory in a specified form, which included the phone numbers of senders and recipients and the time of sending messages, which saved researchers from additional verification.

3. Uploading messages to a remote server for the purpose of editing them and further transmission of messages carried out by users via e-mail (e-mail). Thanks to the development and improvement of Android smartphones, when writing messages, a backup copy is saved in Gmail, while erasing all user data. Such a system, which guarantees complete anonymity, allowed researchers to include written messages in the corpus without fear of losing confidentiality [Chen, Kan, accessed 20.02.2023].

We have chosen 2000 SMS received in 2004 and 2012 and with the help of a text and source code editor for use with Microsoft Windows, Notepad++ [6, accessed 25.09.2022], we removed the non-textual information about respondents and their mobile devices (id or the serial number of the message; collection method and the year of sending SMS) that could interfere with the statistical analysis

of messages by software, which could lead to false indicators as a result. The message document itself was reformatted from XML to text format (txt).

When the texts were prepared for the analysis we turned to the program AntConc. “It is a freeware, multiplatform tool for carrying out corpus linguistics research, introducing corpus methods, and doing data-driven language learning”, developed by Laurence Anthony, Professor of the Faculty of Science and Engineering at Waseda University in Japan [4, accessed 20.10.2022].

Thus, with the help of the program AntConc we have identified the most frequent words undergoing the lexical compression. Lexical compression in SMS from the NUS SMS corpus is marked in the following ways: the partial reduction of a word, the vowel reduction, the word change, the replacement of a word with a letter/number and abbreviations, which are related to both content and function words. Here we show not all, but only some examples of the lexical compression related to:

- both SMS of 2004 and 2012:

- **gd (good)** — the vowel reduction:

Haha... Gd... Cos u too free rite... I also got think of u... (<message id="1155">)

Yeiyei...?????! hee. Take a GD rest . I still waiting for bus. (<message id="20922">)

- **thanx (thanks)** — the word change:

Thanx but my birthday is over already. (<message id="674">)

Sms me again when u send me the email...thanx.. (<message id="21887">)

- **days of the week (by the first 3 letters)** — the partial reduction of a word:

I havent lei.. Next mon can? (<message id="321">)

Sat dinner is fine. (<message id="17274">)

- only to SMS of 2004:

- c (see)** — the replacement of a word with a letter:

Eh sorry leh... I din c ur msg. Not sad already lar. Me watching tv now. U still in office? (<message id="614">)

Sorry i now then c ur msg... Yar lor so poor thing... But only 4 one night... Tmr u'll have a brand new room 2 sleep in... (<message id="790">)

- **w (with)** (figure 2):

Doing project w frens lor. (<message id="329">)

Oh... Okie, u send me his no lor... Den i discuss w him first... (<message id="1943">)

- **y (why)**:

That's y i said it's bad dat all e gals know u... Wat u doing now? (<message id="457">)

Dunno y u ask me. (<message id="567">)

dong. Then u suddenly jus tell him u attach w darren? Then u got ask wat present he wan?
 put on both weekend. Sunday we meeting 4 lunch w e rest right.Ok we meet 5 orchard shop shop
 now. I'm not driving today. Doing project w frens lor. I'm not coming home 4 dinner.
 ?Haha..Only bz w soccer meh, not goin out w gals ah... Ya, uni can meet guys but not
 over liaoo.. U goin 4 wat camp? Wow... Joan goin w her bf, her parents allow so gd ah..Haiz,
 it'ur bd... Ya, i went out w her but i only realized on e day itself
 already. Xy wants 2 shop so i'm shopping w her now. I'm going 2 orchard now laready
 in e afternoon so i'm not watching w her. So c u wan 2 watch today or tmr
 , u send me his no lor... Den i discuss w him first.. Haha... Ok ok, we all pon... Pink
 , but wanted 2 buy wk clothes but now go out w him i also cant shop. So how he tell
 ask me. If u alone then wan do project w him i can help u ask. U taking contemporary

Figure 2. The compression of the preposition ‘with’ in SMS of 2004 from the NUS SMS corpus received by AntConc

- only to SMS of 2012:
 - **nvm (never mind)** — abbreviations:
 Lol **nvm** I go print then (<message id="18193">)
Nvm nothing already. Needed help registering for the automation project.
 (<message id="16407">)
 - **pls (please)** — the vowel reduction:
 Hey...**pls** add ur references in the ic engine project paper by sat night... (<message id="21883">)
 I have make more changes to the final report..uploaded liaoo...**pls** usethe lastest report... (<message id="21785">)
 - **btw (by the way)** — abbreviations (figure 3):
Btw... do you have popular card? (<message id="16943">)
 Ok.. **btw** we are doing advertising for all food stalls as well right?The reservation is only for restaurants but advertising for all foodoutlets.correct? (<message id="19373">)

find such good speaker in soc. **Btw, are they a couple?**Haha. Send
 = "24186" > <text>Im ending at 6 today. **Btw assumption english called me.**</text> <
 > <message id="15193"> <text>Okay. **Btw, can i ask** when do u
 for astro eh. Got extra duties :(**btw can youget Vincent** to call me?
 okay sorry about it. Happy birthday **btw :-D**</text> <source> <srcNumber>975B
 again,he'll forget u one. **Btw, did siti inform u** that the
 essage> <message id="15477"> <text> **Btw, did TG update u** on IS &
 's more or less the same. **Btw, did u create** anymore classes other
 mods no friends take withme! Haha. **Btw, do u know** any websites that
 good morning! Haha. Okay can. But **btw, do unknow that rd 1a** ends

Figure 3. The example of ‘by the way’ usage in SMS of 2012 from the NUS SMS corpus received by AntConc

Besides the analyzed words there are other examples of lexical deviations (*lk* for ‘look’; *nxt* for ‘next’; *shld b* for ‘should be’; *wk* for ‘week’, etc.), but to a lesser extent:

Den wat will e schedule b lk on sun? (<message id="48">)

Hmmm... My lect end at 2... Shld b ard in late afternoon lor... (<message id="1767">)

Den we will still b given student price and loan rite... Hey how u noe comin nxt wk (<message id="1693">)

The usage of short forms specific for SMS from the NUS SMS corpus can be explained as the products of the collective identity function because the respondents are people of the same age group speaking on the language reflects their national identity. Moreover, according to N. Doring “the specialized use of short forms is an indicator of belonging in a community and is a component of the group identity” [Doring, 2002: 120].

Y. Hard af Segerstad claims that the linguistic economy law on the syntactic level can be realized through the omitting punctuation, unconventional punctuation, omitting space between words and so on in the text messaging [Hard af Segerstag, 2002: 218-219]. In our research we have found that the omitting punctuation, which reveals itself through the absence of the apostrophe in SMS of 2004 and omitting space between words in SMS of 2012 are specific to the texts from the NUS SMS corpus.

The omission of the apostrophe in SMS of 2004 leads to the contraction of two words or parts of them into one construction in order to “save keystrokes, which could be important when the message size is restricted by technical limitations” [Hard af Segerstag, 2002: 218-219]. Results show that the strategy of apostrophe omission is mainly used in negation in SMS of 2004:

Haha... dont be angry with yourself... Take it as a practice for the real thing. => (<message id="122">)

Huh but i cant go 2 ur house empty handed right? (<message id="792">)

My supervisor find 4 me one lor i thk his students. I havent ask her yet. Tell u aft i ask her. (<message id="615">)

Such spelling can be explained by the lack of ambiguity in constructions of this type, because the omission of the apostrophe does not lead to misunderstanding of the word or the whole message.

The omitting space between words which is observed in SMS of 2012 from the NUS SMS corpus (figure 4) is identified by Y. Hard af Segerstad as “similar to the strategy to omit punctuation, by omitting space between words the user saves keystrokes as well as time and effort” [ibid.]:

I should think so... how else are you gonna compare differencesbetween differ-ent groups? Like, I'm doing gender... (<message id="17541">)

Oops. I forgot. What time are we meeting? I was still checking theemail inbox for ur mails...-P (<message id="19682">)

```
<message id="17341"><text>I should think so... how else are you gonna compare differencesbetween different groups? Like, I'm doing gender...
<message id="19682"><text>Oops. I forgot. What time are we meeting? I was still checking theemail inbox for ur mails...-P
```

Figure 4. The example of the omitting space between words in SMS of 2012 from the NUS SMS corpus

So, our study concludes that the lexical and syntactic compression plays a significant role in SMS from the NUS SMS corpus. The spelling of the compressed words illustrates that the vowels are often eliminated or unpronounceable letters are removed, but the full form of the word can be easily restored by the sequence of consonants. This type of compression reflects the characteristics of the youth language as an indicator of one group identity. The syntactic strategy of compression such as omitting apostrophe and space between words allow the users to save keystrokes, time and other important points while messaging. Thus, it can be concluded that the compression is an effective way to remove unnecessary parts of the words and space while preserving their meaning. Further research will show whether the situation related to lexical and syntactic compression will change as well as the possibility of changes at other language levels.

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对 V.G. 的看法 拉斯普京在中国批评中的创造力
**PERCEPTION OF V.G. RASPUTIN'S CREATIVITY IN CHINESE
CRITICISM**

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抽象的。 本文主要讨论现代俄罗斯散文在中国的接受问题。 中国人民通过文学发现了俄罗斯世界。 对中国读者来说特别重要的是俄罗斯作家作品中的精神和道德成分。 在俄罗斯有关村庄的作品在中国传播的同时，他们也在积极进行研究。 V.G.的创造力 拉斯普京受到了中国科学家和评论家的特别关注。 文章介绍了来自北京和南京大学的中国科学家的几篇文章的内容。 他们分析的一个重要结论是，拉斯普京作品中的人与自然和谐的思想与中国古代生命哲学“天人合一”有相似之处。 这是中国古代儒家思想家的基本哲学立场，是中华文化生态智慧的核心，也是对全人类的启示。

关键词：现代俄罗斯散文在中国、乡村作品、拉斯普京、接待。

Abstract. *The article is devoted to the problem of reception of modern Russian prose in China. Through literature, the Chinese people discover the Russian world. Of particular importance to Chinese readers is the spiritual and moral component of the works of Russian authors. In parallel with the spread of Russian works about the village in China, their active research is being conducted. The creativity of V.G. Rasputin was noted with special attention by Chinese scientists and critics. The article presents the content of several articles by Chinese scientists from Beijing and Nanjing Universities. An important conclusion of their analysis is that the idea of harmony between man and nature in Rasputin's work has similarities with the ancient Chinese philosophy of life, "the unity of the environment and man." This is the fundamental philosophical position of the ancient Chinese Confucian thinkers, the core of the ecological wisdom of Chinese culture, a message to all mankind.*

Keywords: *modern Russian prose in China, works about the village, V. Rasputin, reception.*

Russian literature reception in China is relevant due to the role that Russian literature played in Chinese society in the XX-XXI centuries. Russian literature

helped the Chinese reader not only to discover the world of Russian culture, but also to get acquainted with aesthetic models for the development of their own literature. Of particular importance to Chinese readers is the spiritual and moral component of the works of Russian authors, in particular the modern classical prose of Valentin Grigoryevich Rasputin (1937 - 2015) [see: 1, 3, 6, 7, 8].

Rasputin's works appeared in China in the 1980s, which greatly contributed to the development of Chinese literature of the new era. According to a number of Chinese scientists, Rasputin's work most vividly expresses the concept of the Russian national character. The moral pathos of his works attracts Chinese writers most of all. Not to mention the direct borrowing of Rasputin's plots and motifs by Chinese prose writers, one can also see the typological similarity of the creators in connection with similar circumstances of the personal biography of the artists: they were all born in the village, their roots are connected with their small homeland, its land and nature.

A powerful surge of interest in Russian prose occurred in the 1980s. The acquaintance of Chinese readers with V. Rasputin took place in the early 1980s. In 1982, Wang Nai-jo translated for the first time the works of V. Rasputin "The Last Term", "Live and Remember", "Money for Mary" and "Farewell to the Mother" for readers. In 1986, Xu Zhenya translated Rasputin's "Fire" and published it in the magazine "Lotus". Since then, other works of Rasputin have been translated into Chinese one after another, such as "Down and Upstream", "Live forever and Love Forever", "What can I tell the crow?", "Natasha", "Meeting", "I can't...", etc.

About a hundred literary texts about the fate of the village have been translated into Chinese; in addition to the stories of V. Rasputin, these are the works of V. Belov, E. Nosov, V. Astafyev, V. Shukshin. The traditions of Russian literature become a source of ideas and inspiration for such Chinese writers as Wang Meng, Zhang Chengzhi, Lu Yao, Zhang Wei, Xu Huaizhong, Jiang Zilong, Zhu Chunyu, Chen Fan, Ye Zhaoyan, Yue Hengshou [5].

In parallel with the spread of Soviet literature about the village in China, their active study begins. Special attention of Chinese scientists and critics was paid to the work of V. Rasputin. A wide resonance was caused at the end of the XX – beginning of the XXI century by the publication in 1976 of the story "Farewell to Mater" [see: 4].

Thus, Zhou Renmei dedicates an article to her in the Journal of Literature, History and Philosophy [see: 11]. He notes that in "Farewell to Mater" Rasputin, through a broad social context, sharply and directly raises the question of how people should relate to their homeland, to their home, to the land that has fed them for many generations. The Russian word "Matera" has the same root as "mother". The village of Matera is, so to speak, a nursing mother earth, the personification of

the original Russian village. The author, recognizing, like all Soviet “village literature”, that the disappearance of the old village is a natural process, has no purpose to restore the former village life, but is noticeably concerned about irresponsible behavior towards the land. The story of Matera is a story of deep sympathy and understanding of the affection of the older generation for their homeland.

The intense reflections of the main character Doria make us think about the need to protect every inch of the earth as part of the common future of humanity and carefully preserve the foundations of traditional morality. Moreover, traditional morality does not mean backwardness or conservatism, but deep attachment to the native home and an active desire to preserve historically established moral postulates. The writer in no way opposes progress, against the technological revolution: Rasputin thinks about the present, but looks to the future. It is important for him that the economy develops in harmony with the environment. Rasputin insists on the idea that “without a clear spiritual goal, without the right direction, civilization is not only unproductive, but, in fact, harmful” [11].

Wang Peiying, a researcher from Peking University, highly appreciates Rasputin’s work [see: 2]. In his novels, Rasputin presents a picture of modern Russian society, the destruction of traditional virtues, the loss of conscience and humanity, he again and again appeals to his compatriots to return to the foundations. It is in this direction that the writer sees a way out for Russia. Rasputin is deeply concerned about the moral collapse of society: while pragmatism and consumerism have covered the modern world, it is important to preserve the soil of traditional morality and conscience. Literature has never spoken with such concern about the fate of man and the planet he inhabits. The Russian writer defends the spiritual world of millions of people, a world that changes daily and tomorrow will not be the same as today. These are the issues that concern Rasputin, and these are the issues that China is thinking about. only unproductive, but, in fact, harmful” [11].

Another Chinese researcher Zhang Jianhua (Beijing University of Foreign Languages), relying on a socio-cultural approach [see: 9], notes that the division of positions and mixing of values in the post-Soviet literary world were commonplace: many writers refused their right to think, looked indifferently at what was happening or went with the flow. Against this background, Rasputin’s cultural position seems very clear, it is expressed in targeted social criticism, categorical, targeted, point analysis of Russia’s social ills. In this he sees the mission of the writer of the modern era and gathers everyone under the banner of “moral idealism”, a return to nature and religion.

The writer’s passionate attempts at the turn of the 1990s to rebuild his system of literary values also revealed its vulnerable sides. The Chinese researcher calls the following:

1. Rasputin shows life with an obvious emphasis on suffering, trauma and distortions of real life, neglecting other aspects, an artistic approach to overcoming suffering and grief.

2. The backward, closed and almost stagnant patriarchal rural culture in his stories does not change along with social changes. The earth, nature, old men and old women correspond to Rasputin's aesthetic ideal, they still determine the structure of his novels.

3. It is difficult for Rasputin to identify himself emotionally with urban civilization, he is inextricably linked with the village, both by blood and spirit. He sees poverty and deprivation and does not see backwardness and conservatism.

4. If in the 1970s and 1980s Rasputin conveyed his understanding of time and history through characters, scenes and plots, then in the 1990s his position was often conveyed through journalism and public polemics.

The Chinese researcher is particularly concerned about the writer's "nationalism". Rasputin's feelings towards his neighbor China are ambiguous: his statements show rejection of foreign culture, concern and caution about the "alien invasion"[9].

Zhao Yang (Nanjing University)He sees the similarity of Rasputin's concept with the ancient Chinese philosophy of life [see: 10].He is convinced that the roots of the writer's humanism are in understanding the primordial nature of the Russian people, most visibly embodied in female characters: Anna, Daria, Nastya and Alyona. The heroines maintain a natural and indissoluble connection with nature and the earth and are in constant spiritual communion with it. Women's hearts become as broad and generous as Mother Earth herself, they are the focus of traditional virtues: kindness, generosity, humility, loyalty.

In his works, the writer lovingly recreates pictures of the nature of his native land, which express not only longing for the lost homeland, but also a spiritual desire to return, because passionate nostalgia is, in fact, a spiritual rebellion against the evil of the surrounding reality. This feature is called "hidden nostalgia" by a Chinese researcher. Rasputin's "village consciousness" embodies both value fixation and cultural confrontation. When a writer tries to portray the greatness of Angara in his works, he simultaneously complains about the decline of reality; when he depicts a pure and harmonious nature, he simultaneously alienates himself from the dirty urban space; when he shows the purity and steadfastness of Daria, Anna and Uncle Misha Hampo, he protests against the distortion of human nature.

The writer is convinced that merging with nature is a blessing in a person's spiritual life and that only in the embrace of nature can the soul be purified by beauty, experiencing all the mysterious, constantly changing phenomena in it. Rasputin strives to convey the beauty of the untouched nature of Russia in order to convey this deep feeling to the hearts of all Russians, to encourage them to their roots and to realize the meaning of their own lives.

The Chinese scientist claims that the idea of harmony between man and nature in Rasputin's work has similarities with the ancient Chinese philosophy of life – “The unity of the environment and man.” This is the fundamental philosophical position of the ancient Chinese Confucian thinkers and the core of the ecological wisdom of Chinese culture. In the traditional concept, “environment” means the harmony of yin and yang, the flow of the five elements, the change of day and night and the cycle of the four seasons in the universe and nature. As an individual being, a person should be involved in this subtle order of life, striving for freedom of mind and eternal life in co-development with nature. In the work of the Russian traditionalist writer Rasputin, the Chinese researcher sees the same “intellectual light” [10], the light of man's spiritual communication with nature and direct contact with the earth, in its cultivation and processing.

Thus, researchers from China, highly appreciating the story of V. Rasputin “Farewell to Mother”, connect the themes and problems of Soviet village prose with issues of both present and future development of mankind, emphasize either a socio-cultural approach, or a moment of naturalness and harmony of man and nature.

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印欧话语背景下的特里皮利亚文化和颜那亚文化
**TRYPILLIA AND YAMNAYA CULTURES IN THE CONTEXT OF
INDO-EUROPEAN DISCOURSE**

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抽象的。关于印欧问题的知识积累，考虑到新的古成因研究方法的引入，使得人们有可能对特里皮利亚文化和颜那亚文化在导致定居的迁移过程中所发挥的作用提出一个概括的概念。欧亚空间中的印欧人。对每种文化的起源和语言地位的确定导致了关于印欧民族发生最早阶段的系统结论。特别是，可以确定印欧语系分化为赫梯语-卢维亚语（已灭绝）和古语（包括所有现代印欧语方言）分支，发生在安纳托利亚，然后在新石器时代晚期迁移到欧洲。公元前八世纪的时代。

关键词：印欧人、赫梯人、迁徙、线粒体单倍群、Trypillia、Yamnaya 文化、Budjak 文化。

Abstract. *The accumulation of knowledge on Indo-European issues, taking into account the introduction of new - paleogenetic - research methods, made it possible to present a generalized concept of the role played by Culture Trypillia and Yamnaya Culture in the migration processes that led to the settlement of Indo-Europeans in the Eurasian space. Determination of the origin and linguistic status of each of the cultures led to systematic conclusions about the earliest stages of the Indo-European ethnogenesis. In particular, it was possible to establish that the divergence of the Indo-European family into the Hittite-Luvian (extinct) and archaic (including all modern living Indo-European dialects) branches occurred in Anatolia before the migration to Europe in the late Neolithic era in the VIII millennium BP.*

Keywords: *Indo-Europeans, Hittites, migration, mitochondrial haplogroups, Trypillia, Yamnaya Culture, Budjak Culture.*

Background. The Indo-European language family is a unique phenomenon in the history of mankind - speakers of Indo-European languages settled in the vast expanses of the Old World from Ireland to the Xinjiang Uygur Autonomous Region of the People's Republic of China (in particular, the Tochars). Thus, long before the emergence of such phenomena as the Great Silk Road or the Shanghai

Cooperation Organization, the Indo-Europeans formed a single cultural and economic space in the expanses of Eurasia, within which there was an exchange of metalworking technologies, raw materials, spiritual values, myths and rituals (for example, a kind of Scythian world with original style in art). It is all the more important to determine the sources and boundaries from which the Indo-Europeans began their settlement in Eurasia.

Methods. Until the 1980s, the Indo-European discourse was dominated by the belief that the Indo-Europeans were the indigenous inhabitants of the Eurasian Steppes (in particular, the Black Sea Steppes). The English historian Sir Colin Renfrew proposed an alternative version of the migrations of the Indo-Europeans - they were the first Neolithic farmers in Europe who brought from the Middle East (specifically - from Anatolia, from the territory of the modern Republic of Turkey) the skills of a productive economy [1]. In the Soviet Union, this hypothesis was supported by Dr. Vladimir Alexandrovich Safronov [2]. According to the Middle Eastern concept of the origin of the Indo-Europeans, coming from Anatolia, they settled in the Balkans, and specifically on the Danube, forming Cultures Linearbandkeramik, Lengyel and Alföld (on the territory of the modern Republics of Hungary and Slovakia). From the Danube, Indo-Europeans began migrating to the steppes of Eurasia, overcoming the Dnieper line and entering the Tarim River basin in Chinese Xinjiang [3].

This hypothesis has found its material confirmation due to the introduction of methods of paleogenetic analysis of mitochondrial DNA of the remains of ancient people belonging to various archaeological cultures and populations. An important role was played by many years of research by Chinese scientists under the guidance of comrade Chunxiang Li from Jilin University (Changchun) [4]. They found in the ancient inhabitants of the Tarim Basin the same mitochondrial haplogroups H, K, U2e, U5a, T2, which were previously found in the area of the Danube cultures [5].

Results. At this stage of historical research, at least two waves of migrations from Anatolia to the Balkans have been recorded, and each has formed its own circle of archaeological cultures. Serbian archaeologist Milutin Garašanin calls them early and late Balkan-Anatolian complexes [6]. The earliest Anatolian genes in Europe (modern Republic of Bulgaria) date back to 7070±50 BP [7]. The derivatives of the early Balkan-Anatolian complex are Cultures Linearbandkeramik, Lengyel and Alföld, the late Balkan-Anatolian complex includes the Boian culture on the territory of modern Romania. In the middle of the 20th century, Romanian and Soviet archaeologists established the origin of the Tripoli culture (on the territory of modern Ukraine) from the Boian culture [8]. At present, this genetic connection is beyond doubt, which suggests the Indo-European ethnic composition of the Tripoli population. The earliest Trypillia settlements date back to 6510±55 BP [9]. English historian Professor J.P. Mallory admits that the Trypillian culture

could be the archaeological equivalent of the entire eastern branch of the Indo-European family [10].

Because of this, the Trypillian culture plays a key role in the Indo-European discourse. It was the most eastern of the agricultural cultures of Europe, directly bordered on the Eurasian steppes. From the area of Trypillya, the model of the productive economy spread to the East, and the carriers of this model were Indo-European migrants. Accordingly, Trypillia was the last stop of the speakers of various Indo-European dialects before their migration to the Steppe and further to the East up to Xinjiang, Central Asia and India.

On the other hand, the Yamnaya culture was the westernmost steppe (pastoral, pastoral) culture, directly bordering Tripoli, and at the same time undoubtedly Indo-European. This point of view was held by both supporters of the steppe hypothesis of the origin of the Indo-Europeans (G. Child [11], M. Gimbutas [12], D. Anthony [13]), and supporters of the Neolithic (Danubian, Middle Eastern) concept.

For a long time, the Indo-European discourse was dominated by the hypothesis put forward by the patriarch of Soviet archeology Nikolai Yakovlevich Merpert about the origin of the Yamnaya culture from the Volga-Ural interfluvium [14]. At the end of the Soviet era, V.A. Safronov put forward the opposite hypothesis, based on the fact that the ceramic complex of the Yamnaya culture quite clearly divides into two zones - to the east and west of the Dnieper [2], which indicates a different origin of the Yamnaya culture in these two areas. Currently, this paradigm is shared by many Russian and Ukrainian researchers [15].

The eastern variant of the Yamnaya culture is often referred to as the Repin culture (after the archaeological site at the Repin farm on the Don), the most ancient monuments are the burial mound Shumeika (5420 ± 100 , 5290 ± 100 BP) in the Samara Oblast of Russia [16].

The western variant of the Yamnaya culture will break up into three local variants.

1. The Middle Dnieper variant (Kyiv and Cherkasy regions of Ukraine), which became the basis of numerous cultures of Corded Ware in Europe [17], obviously comes from the Tripoli culture, on the monuments of which the cord ornament was first recorded [18].

2. The Lower Dnieper variant of the Yamnaya culture is represented by the reference settlement Mikhailovka II (Kherson region), dated $4710-4480 \pm 75$ BP [18]. Mikhailovka II also reveals a genetic connection with the ceramic traditions of the Trypillia settlements, as well as the Trypillia technology for constructing adobe stoves instead of primitive hearths [19].

3. Finally, the Budzhak variant of the Yamnaya culture (Odessa Oblast of Ukraine), dated to $4770-3700 \pm 90$ BP [20], whose representatives migrated to the Danube and the Balkans (to Romania, Hungary, Bulgaria and Serbia) [21].

The analysis carried out by the Ukrainian researcher Dr. Svetlana Vladimirovna Ivanova shows that the Budzhak culture was based on the *Eneolithic horizon, which is practically indistinguishable from the Pit Grave* [22]. Beyond this conclusion, Dr. S.V. Ivanova did not go, but at the current level of historical knowledge, this conclusion in itself fully confirms the hypothesis of 1974 by Dr. V.A. Safronov that the most ancient monument of the entire Western variant of the Yamnaya culture is the mound of Dumyany (Moldavian Republic). In this barrow, burials were made according to the pit rite (crouched on the back, oriented to the west) and are accompanied by ceramics from the Trypillia settlement of Dragusheni [2]. This allows us to date the Dumyany barrow at 5355 ± 100 BP [23].

Discussion. It becomes obvious that at the two opposite ends of the Yamnaya region, two different variants of the Yamnaya culture simultaneously arise: Repinsky (Shumeyka barrow, Samara region, 5420-5290 BP) and proto-Budzhaksky (Dumyany barrow, Moldavia, 5355 BP). The origin of both variants is completely different. The Budzhak variant arises in the very heart of the Trypillia culture, surrounded by Trypillia settlements. And we are convinced that the presence of Trypillian ceramics in the Dumyany mound is not a mechanical borrowing, but a direct evidence of the origin of the Yamnaya (Budzhak) culture from the Trypillia. Systemically related to this statement is the discovery of Trypillia elements in other western variants of the Yamnaya culture (Sredneprovsk and in Mikhailovka II). Therefore, we agree with the opinion of J. Mallory and K. Renfrew that in the middle of the 4th millennium BC. there is a shift towards pastoralism of a certain component of Trypillia society [24]. In other words, the Trypillians are moving to the steppe way of life and form all three western variants of the Yamnaya culture. Having become real nomads, the former Trypillians were able to settle over vast distances along the Eurasian Steppe. This is the conclusion we must draw if we want to understand the migrations of the Indo-Europeans, and how they could end up in Xinjiang, Central Asia and the Indus Valley.

At the same time, a number of questions remain debatable - whether the Trypillian culture was the archaeological equivalent of the entire eastern branch of the Indo-European family, or whether individual Indo-European dialect populations (for example, the Indo-Iranians) only passed through the Trypillia area in their migrations from the Danube to the East, forming variants of the Yamnaya culture in the Steppe, and then - what kind of Indo-Europeans were Trypillians? In a systemic connection with these questions, there are others - do all modern Indo-Europeans come from only one of the two waves of migrations of Neolithic farmers to Europe (and the other, respectively, turns out to be a dead end), or the Indo-European populations, whose descendants were recorded by written sources, were somehow distributed between these two waves?

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“美国五人组”在美国作曲学校组建中的作用
**THE ROLE OF «THE AMERICAN FIVE» IN THE FORMATION OF
THE COMPOSITION SCHOOL IN THE USA**

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抽象的。美国五人组是美国现代主义作曲家的统称：查尔斯·艾夫斯、约翰·J·贝克尔、沃林福德·里格、亨利·考威尔和卡尔·拉格尔斯。这些作曲家以其现代主义作品而闻名，这些作品以独特而鲜明的美国风格创作。

本文概述了美国五人组的创新，以及该群体在美国作曲家流派形成中的作用。

关键词：美国五人组、查尔斯·艾夫斯、约翰·J·贝克尔、沃林福德·里格、亨利·考威尔、卡尔·拉格尔斯。

Abstract. *The American Five is a collective name applied to American modernist composers: Charles Ives, John J. Becker, Wallingford Rigger, Henry Cowell, and Carl Ruggles. These composers are known for their modernist compositions, which are written in a unique and distinctive American style.*

The article provides an overview of the innovations created by the American Five, as well as the role of this group in the formation of the US composer school.

Keywords: *American Five, Charles Ives, John J. Becker, Wallingford Rigger, Henry Cowell, Carl Ruggles.*

The development of musical culture in the United States took place in unusual ways, different from all that were available in other countries. The colonization of the American continent by immigrants from Spain, England, France, the Netherlands and other countries was accompanied by an influx of various types of folklore and everyday genres from these countries. Also, samples of original Afro-Negro music were brought by Negro slaves, who were brought in huge quantities from Africa. A separate branch in US culture was formed by new types of amateur music: pop, salon, popular church hymns, marches for brass bands, dance, and so on. That is, as S.Yu. Sigida: “Since its inception, the culture of the United States has been a multicultural space that has united the traditions and customs of many peoples, previously incompatible, but accidentally found themselves side by side, in the conditions of the formation of the cultural values of the young state. The

main thing is that as a result of this synthesis, it is pluralism that has become a characteristic feature of American culture” [4, p. 8].

By and large, this purely provincial art exhausted everything that arose on American soil from the end of the 17th to the end of the 19th century. Until the 19th century, not a single phenomenon arose in North America that could be assessed as an analogue of the composer’s school in Europe. It was only in the last quarter of the 19th century that the first somewhat authoritative school of composition emerged in the United States, the so-called “Boston School”, which was grouped around the university department of composition and was of a purely academic nature. None of her products had a resonance in the American environment. “None of the works created by its leading representatives (Parker, Chadwick, Lefleur, Buck and others) entered the concert or opera life of the United States. However, the “Boston School” played an important role in the development of American musical culture, because here, for the first time in the entire existence of the North American civilization, the professional musical creativity of the United States approached the technical level and artistic style of European operatic and symphonic music” [1].

The situation began to change only at the beginning of the 20th century. Among American composers, it became fashionable to travel to Western Europe to study, since it was believed that a high level of composition could be obtained only in the conservatories of the Old World. In 1921, the American Conservatory was opened in Fontainebleau, a suburb of Paris. All the most important musical, theoretical and practical disciplines were taught there by Nadya Boulanger, a musician of Russian-French origin, who played a decisive role in the development of the US national professional composer school. That’s where the American musicians rushed. There were many composers from the USA who studied at the American Conservatory of Fontainebleau, among them: Aaron Copland, Virgil Thomson, Roy Harris, George Kirkpatrick, Elliot Carter, Douglas Moore, George Antheil, Cole Porter, Walter Piston, Louise Talma, Eli Siegmeister, Mark Blitzstein , Philip Glass and others.

Young American musicians, inspired by N. Boulanger, set as their goal the creation of national American music. One of the initiators of this process, A. Copland, said: “French music can usually be recognized completely unmistakably, it is so national in character. I couldn’t understand why we Americans can’t write serious music in which listeners could catch something typically American, especially since jazz composers and ragtime creators originated in America, the whole world recognized this” [3, p. . 123].

But there were also composers in the USA who were not trained in Europe. They received their education at home in the New World. These musicians began to use non-traditional musical instruments, jazz rhythms, numerical structures, etc., while not equaling the musical trendsetters from Europe.

Such a group of composers were members of the so-called «American Five», in whose work modernist tendencies were clearly manifested. The central figure of this group of like-minded composers was Charles Ives, around whom Carl Ruggles, Wallingford Rigger, John Becker and Henry Cowell united. The name of the group was invented in 1928 by Becker - by analogy with the Russian «Mighty Handful» and the French «Six». «John Becker, in an article entitled «The American Five» in the Northwest Musical Herald magazine, outlined the main objectives of the group. Its main goal was mutual support, development of a new musical language and new principles of composition, performance and promotion of contemporary music. Becker emphasized in his article that the experimental tendencies of American composers grew, most likely, from their own, domestic, rather than European experience» [5, p. 324]. Each of the members of the «American Five» continued to be a member of the Commonwealth until the end of his life.

The main figure of the group - Charles Ives (Charles Ives) (1874-1954) - the first major professional composer in the United States. From the age of fourteen, Ives studied composition with Horatio Parker at Yale University, but after graduation, he studied composition only in his spare time. In his early work, Ives was firmly associated with the traditions of domestic and church genres that dominated the cultural life of the United States until the 20th century. Ives' art was formed under the influence of the most typical phenomena of the musical life of the wide American folk environment - brass bands, ensembles, choirs, mass folk festivals. The richest folklore of different peoples who inhabited America, a lot of national genres were not only the origins of Ives's thematics. They were included in the form of numerous quotations in various of his writings. In the process of learning, the composer mastered traditional European genres: symphony, sonata, quartet, trio. It was then that he wrote such works as the First Symphony (1898), the First String Quartet (1896), the Piano (1909) and Violin Sonatas, songs. All of these influences testify to Ives' careful study and assimilation of the European musical tradition that pervaded his works of the middle and later periods.

Along with this, he actively used the experience and traditions of American music, which he learned in his early years. Melodies of Protestant hymns and gospels are heard in the First String Quartet (1902). Echoes of popular dances and salon songs, as well as church hymns, are heard in his Second Symphony (1902).

All this gives Ives' music a polystylistic contrast. It was the synthesis of the diverse traditions of American culture and European classics that nourished the composer's work. Based on the interweaving of various threads, he managed to create his own unique language. Ives was also a bold experimenter. He used the most complex ways of organizing the musical fabric - polytonal, polymelodic, polyrhythmic techniques, phonic and timbre-color effects, which later began to be used in the music of our century. In piano music, instead of organized sounds,

such techniques as clusters arose, the effects achieved by pressing the keys on the board, etc., were played up. However, the main thing in Ives's work was that the composer sensitively and attentively listened to the sounds of everyday folklore and in a peculiar way translated its various elements into his music.

He developed a unique composing style, independent of European traditions. Turning to the melodies of American songs and hymns, Ives managed to create an original synthesis of popular and professional music, a fusion of contrasting elements of heterogeneous American culture. He used innovative techniques, many of which anticipated the search for Western European composers, including the quarter-tone system and serial technique. In his works, the author used polytonality and polyrhythm, aleatoric, collage and much more. Ives' music is a kind of encyclopedia of American life. Copland noted that Ives was the first to «connect the music he wrote with the way of life he knew» [5, p. 332]. Charles Ives is one of the founders of the modern American school of composers. He is the author of six symphonies (the sixth, «World» (1915-1928) was not completed), two string quartets, a collection of «114 songs» (1922), etc. Currently, Ives is recognized as one of the most significant US composers. A crater on Mercury is named after Ives.

Of all the members of the Five, Ives was closest to Carl Ruggles (1876-1971). They were also related by a common worldview and philosophical views with a touch of mysticism. He was a champion of the new art like Ives and rejected any kind of academicism. Carl Ruggles was brought up in the traditions of the Boston New England School and received an exclusively American education at Harvard University.

In his early compositions, Ruggles used extended tonality and performed with these works saturated with sharp dissonances. At that time, almost no one was developing these elements in the music of the United States, and for Europe it seemed very daring. Ruggles was trying to free himself from the strict and harsh puritanism that still hovered in New England. It was Ruggles and Ives who were often named on a par with the European «radical» A. Schoenberg.

“The famous American musicologist Charles L. Seeger wrote a detailed article about Ruggles in 1930, in which he presented him as an amazing personality, a great musician in the context of the era” [5, p. 326]. Moreover, Seeger considered the work of Carl Ruggles comparable in importance only to the work of Ives. Charles Seeger also made an important point in the article that Ruggles's life path, like Ives's, reflected «the tragedy of American music». Being ultra-radicals in a country that did not have a strong musical base in the past, neither the businessman and musician Ives, nor the self-employed Ruggles, found a worthy place in the then musical life of North America. The renaissance of their music and fame began only at the end of the 20th century.

Ruggles repeatedly said that creative work cannot be taught. Like Stravinsky, Carl Ruggles liked to compose at the piano and construct various harmonies, ex-

plore their coloration and discuss various theoretical problems with his friends, and above all with Seeger.

He destroyed most of his early compositions (before «Toys»), so his composing style of that period remains a subject of debate: music critics suggest its similarity to the romanticism of the late 19th century. Despite the small number of compositions, the composer was able to create his own individual musical world, which is of great importance for American music.

One of the early works of Ruggles is the song cycle «Toys» (1919) on his own texts, accompanied by piano, dedicated to his son Micah. Already in this work, the main features of the author's musical style are manifested: the free use of dissonance, clusters, irregularity of rhythm and meter. Another example, Angels is a small atonal piece, clear in architectonics, in a simple three-part form. Its middle section is highly developed and complex in texture, which is saturated with sharp dissonances and layers of seconds and sevenths. This play, expressionist in nature, initially caused a negative reaction from the public. It was the atonality and dissonant style that provoked the controversy. To an unprepared listener of that time, such dissonances sounded extremely harsh. In this piece, the characteristic features of the composer's mature style appeared: a combination of dissonant harmony and contrapuntal independence of voices («dissonant counterpoint», according to the musicologist Charles Seeger).

Carl Ruggles wrote several works for orchestra, such as «Suntreader» (1932), «Organum» (1945-1949), «Portals» (Portals, 1926). Among the pieces for chamber-instrumental ensemble, the most famous are the «symphonic suites» Men and Angels (1922), Men and Mountains (1924); «The voice of one crying in the wilderness» (Vox clamans in deserto, 1925). The cycle «Toys» (Toys, 1919) for voice and piano and others is also popular.

Ruggles' modernist aspirations were expressed in the use of an extended tonality, an acutely dissonant style, quoting and collage techniques, free aleatorics, and timbre uniformity in instrumentation. Ruggles addressed topics with non-repeating sounds, often divided into trichord segments consisting of a tritone and a second. In the second half of the 20th century, this technique was developed by M. Babbitt, who created the theory of hexachord combinatorics. Thus, Ruggles is one of the brightest representatives of modernism in the first half of the 20th century, whose traditions were continued in the work of post-war avant-garde artists in the United States.

Wallingford Riegger (1885-1961) belonged to the next generation of the American Five who brought new ideas to US music. W. Rigger studied at the Institute of Musical Arts (now the Juilliard School). He was known for using the twelve-tone system, related to the Schoenberg system. He became acquainted with this technique thanks to Adolf Weiss, an American student of Schoenberg. In ad-

dition to Schoenberg, Rigger was significantly influenced by his friends: Henry Cowell and Charles Ives.

Wallingford Rigger developed the artistic and aesthetic principles of the «American Five» and experimented in the field of dodecaphony, putting forward a number of creative ideas. Rigger showed interest in dodecaphony as early as 1932. His path to dodecaphony, like the path of other American composers, went through a gradual complication of harmony. After the 1950s, Rigger's fascination with seriality gradually faded away.

Since the 1920s experimented in the field of sonorism, for example, in the play «Sonoristic Etude» for 10 violins (Study in sonority, 1927) and acted as an ultramodernist. But the leading role in his work in the 1920s and 1930s undoubtedly belongs to his modernist searches in the field of musical stage compositions - ballets, which he created in collaboration with the three most radical American dancers and choreographers: Martha Graham, Doris Humphrey and Chania Holm . «Rigger expressed his attitude to work in the field of ballet theater in the article «I compose for contemporary dance»: «My main goal is to create music for dance that can become an independent composition» [5, p. 343]. In dance music, Rigger was greatly influenced by Stravinsky's ballets. Based on his dance compositions, Rigger wrote suites for large orchestra. Themes from his compositions for contemporary dance theater were often used by him later in symphonic works.

From 1941 he concentrated almost exclusively on instrumental music. His Symphony No. 3 (1947) won the New York Music Critics' Circle Award and the Naumburg Foundation Recording Award.

John Becker (1886-1961) was a representative of the American Five, whom critics call the «forgotten man» of American musical modernism. Becker received his musical education at the Cincinnati Conservatory of Music, then at the Wisconsin Conservatory of Music in Milwaukee.

Becker's creative heritage includes a variety of genres. He is the author of 7 symphonies, 6 instrumental concertos, quartets, very radical musical stage compositions, songs, piano pieces. Like other members of the American Five, Becker created music for modern dance, but she did not occupy a leading position in his work, like Rigger. Many of Becker's works remained in manuscript even after his death.

In the 1920s, Becker wrote a number of piano pieces and symphonic poems, in which he used polytonality, sonoristics, and dissonant harmony. Among them - the piece «Eibongo» for 13 percussion (Abongo, 1933), which anticipates rehearsal technique, as well as «Dancing Figure» for voice, dancers and orchestra on the verses of Ezra Pound, «Pastoral Concerto» for two flutes and orchestra (Concerto Pastoral: A Forest Rhapsodie), which mimics the chirping of the birds of their home state of Minnesota.

In his works, Becker paid special attention to the sonorous possibilities and qualities of musical material - it was not for nothing that he often used the name "Soundpiece" for his plays. In music, Becker gravitated towards the constructivist style, the complication of harmonic, rhythmic language and contrapuntal technique. His work, like other members of the American Five, is most characterized by the free use of dissonance. If Ives created a spatial effect with the help of dissonances, Ruggles turned to dissonance as one of the aspects of the contrapuntal independence of voices, then Becker used dissonances to express expression in music.

Henry Cowell (1897-1965) was the youngest and most active member of the American Five. Cowell received his musical education at the University of California (Berkeley), and then continued his studies in New York.

Cowell left a bright mark on the history of American music. His experiments in line with musical constructivism began in the 1910s. Among them are polyphonic complexes, the so-called «blot chords», sound «bundles», later called clusters, playing the prepared piano and others, which he developed mainly in instrumental works of the early period (1910-1920s). None of Cowell's innovations has been as well-known and at the same time has not been subjected to such huge criticism as clusters. For example, in his piece *The Tides of Manaunaun* (1917), the pianist used his fist, palm, and forearm to play the lower register keys to represent the large waves of the tide. This early piece is an example of what he called a «bunch of sounds» - a cluster. "Later, the composer was called "The Cluster Man", and his work became "a symbol of the musical progress of the 20th century" [4, p. 49].

In «*The Aeolian Harp*» for Piano (1923), Henry Cowell instructed the pianist to play inside the instrument, striking, scraping, pulling, and muffling the strings. And in the piano piece «*The Banshee*» (1925), Cowell used original graphic notes with instructions for the pianist playing exclusively inside the piano while his assistant held the right pedal. Playing methods included string-scraping sequences with plucked nails performed in the lower register, which resonated and produced sound waves that had no definite pitch.

Cowell's later music also included many innovations, but over the years his composing language became increasingly simplified, both tonally and rhythmically. He wrote many plays reflecting his interest in rural American songs, Irish folklore and oriental music.

Summing up, we note the following:

- The independent musical tradition of the USA started relatively late. To do this, she had to overcome imitation and dependence on cultural imports from Europe. It can be said that it was only at the turn of the 19th and 20th centuries that large, original American composers appeared who did not owe their style to anyone.

- Since there was no centuries-old artistic continuity in America, the composers were not dominated by the aesthetic model of thinking formed in Europe, that is, it was easier to take risks and experiment in something. The pressure of the European tradition was not strongly felt.
- Modernism in the USA began earlier than in Europe. Already in the 1890s, in the music of the forefather of the American avant-garde, Charles Ives, one can hear such crazy experiments, such freedom from conventions, which at that time were unthinkable in Europe.
- Modernism in the USA followed a different path than in Europe. Many discoveries happened not analytically, not as a result of the creation of complex objects, but empirically - American modernism experimented and got amazing results.

American modernism has always relied on two pillars - nature and multiculturalism: because America has always felt the proximity of the frontier, the zone of development of the Wild West, and also because it sought to express Americanism in the form of the simultaneous sounding of the music of different nations and people of different races living in America in the neighborhood together.

The origins of US musical modernism are rooted in the American experience, not the European one. American modernist composers built their concepts on the basis of the original artistic and stylistic features of American music. "Within the avant-garde style of writing, they sought to embody a truly American flavor of sound, manifested in the characteristic intonations, national features of the music of the peoples inhabiting different states, as well as musical multiculturalism, which is denoted by the concept of a «melting pot»» [2, p. 39]. A striking example of this are the innovations of Charles Ives, John J. Becker, Wallingford Rigger, Henry Cowell, Carl Ruggles, who grew entirely out of the American traditions of the previous eighteenth and nineteenth centuries.

The American Five is among the composers who changed the balance of power in the geography of academic music of the 20th century, becoming the founders of American musical modernism - a generation of eccentrics, radicals, rebels and experimenters. It was in their work that those linguistic discoveries were formed that formed the basis of the American avant-garde.

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城市建筑和艺术环境形成的当代方面
**CONTEMPORARY ASPECTS IN THE FORMING OF THE
ARCHITECTURAL AND ART ENVIRONMENT OF THE CITY**

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抽象的。人们早已认识到当代艺术已经超越了其在博物馆、艺术画廊和收藏中的传统地位。它坚决地跨越了过去将其与街道和城市空间生活分开的边界，首先转变为各种类型的城市艺术品，从纪念性的、装饰性的到画架的。这些物体被分为功能性“发光”雕塑、工程通信的塑料形式、挡土墙和分隔墙、喷泉和水池、城市家具、游戏雕塑。这还包括小型地质塑料、景观和城市雕塑[1]。从20世纪下半叶开始，这种被定义为公共艺术的艺术开始积极参与城市建筑和艺术环境的组织，强调其构图空间、形象和社会心理方面。

关键词：城市艺术环境、城市、空间、当代艺术、艺术潮流、艺术设计、互动性。

Abstract. *The fact that contemporary art has moved beyond its traditional place in museums, art galleries and collections has long been recognized. It resolutely crossed the border that separated it in the past from the life of streets and urban spaces, at first, transforming into various genres of urban art objects, from monumental and decorative to easel. Such objects are classified into functional - “luminous” sculpture, plastic forms of engineering communications, retaining and dividing walls, fountains and pools, urban furniture, game sculpture. This also included geoplastics, landscape and urban sculpture of small forms [1]. From the second half of the 20th century, this art, which was defined as art-public, began to actively participate in the organization of the architectural and artistic environment of the city, emphasizing its compositional-spatial, figurative and socio-psychological aspects.*

Keywords: *urban artistic environment, city, space, contemporary art, artistic trends, art design, interactivity.*

The specific period of penetration of art into the sphere of public life was the end of the '50s / -60s of XX century, when there was a rapprochement between art and mass culture. Time, which, of course, can also be called the formation of a cul-

ture of urban spaces, filling the urban space with a set of visual images perceived as “images”, as pictures necessary for this environment. It is worth mentioning examples of the creative-synthetic community of the era of modernism, which is associated with such important public buildings as the buildings of UNESCO in Paris and the United Nations in the United States. By ordering works from the most famous artists, and including their works in a common artistic ensemble on the principle of free comparisons of architecture and sculpture, such as H. Miro, C. Moore, it became possible to influence the organization of space by means of plastic art. In addition, sculpture, in its expanded sense, began to include the viewer in the context of its own space, its own «territory of influence». This process destroyed the clear boundaries between artistic disciplines, as sculpture began to acquire features characteristic of architecture - to form a space that is integral with the personal space of the viewer» [2].

The art of the great monumental sculptors of the 20th century developed under the sign of asserting the essentiality and content of the plastic principle, revealing its own logic of plastic form and the rich content of the plastic language. However, as early as the beginning of the 20th century, the search for a new visual language of three-dimensional art led to a transformation in the idea of shaping. The achievements of the avant-garde artists of 1910-1920 formed the basis of philosophical conceptualism, which denied “the possibility of subjective artistic expression, creativity in the first person ...” [3] and influenced the attitude towards the form of the last third of the twentieth century. At the same time, post-modernism finally designated the environment as the object of composition: the environment preserves the past and demonstrates the present. O.I. Genisaretsky, considering the phenomena of design and the environment, notes two measures that environmental behavior has: relevance, i.e. the ability to act in accordance with the objective meaning of the situation, and timeliness, i.e. the ability to act in accordance with its temporal significance [4].

The environment becomes a new space for artists to think, poses new challenges and provides unlimited opportunities for the realization of their ideas.

Starting with the invention of a new figurative-visual language, artists and designers approached the creation of spatial objects directly interconnected with the environment and the organization of architectural and artistic space, trying to solve some of the urgent problems of the urban environment identified by V.L. Glazychev as isolation, heterogeneity, density, saturation, scale [5]. If before, the problems of the synthesis of art and architecture were solved within individual structures and most often existed outside the environmental context, then from now on, it is art objects that are called upon to model the modern environmental situation and determine the significance of the place.

The emergence of pop art and other avant-garde movements at the turn of the 1960s and 1970s had a significant impact on public art, which is now oriented to-

wards the perception of the general public and is gaining the status of independent objects. Among them, the works of kinetist artists, which are based on the ideas of the movement of form, stand out especially. New genres of contemporary environmental art are emerging - happenings, urban performances, etc. representing temporary artistic event actions. They were both action formulas in which the viewer can become a participant in artistic creation, and state formulas, the purpose of which is to conquer space (installations).

Recently, art has been finding more and more opportunities to participate in the life of the city, conditioned and generated by its modern features, acquiring new qualities and becoming certain signs of the times. These are the same synthetic art objects that carry a certain intellectual design, but already implemented by modern technical means. So, design joins the traditional arts of painting, graphics, and sculpture.

The gradual transformation of this direction has led to the originality of the use of technical means, generating virtuosity of form, turning art objects into some objects of art design, declaring the properties of interactive art, because, combining the conceptual expression and an obligatory function, these works acquire the possibility of a special emotional impact on viewer, and design, like no other art form today, allows you to connect the subject-spatial environment with the actual philosophy of this era.

The objects of art design, which arose simultaneously with the problem of understanding the environment, become important elements of the development of space. Possessing the ability to influence the environment, carrying the tasks of enriching it, combining both artistic qualities and a pronounced function, clothed in a sharp expressive form, and they can also be mobile, transformable, interactive, etc. In the reference dictionary edited by G.B. Minervin, the term «art design» is defined as one of the directions in the development of modern design, in which there are no differences between functional design, which forms the basis of professional design, and pure, high art [6].

The grandiosity of the designs has become a defining sign of the art design movement. This is evidenced by another new feature of this type of environmental art, which brings it closer to architecture: the possibility for the viewer to actively explore the internal space of an object that often appears in a traditional performance, for example, the work of Richard Sehr, these are not only abstract compositions that complement the space with their scale, but and filling this space with new meaning. Artists dealing with such objects can be more classified as designers than sculptors and architects. That is why art design objects began to acquire not only unusual forms, but also new high-tech achievements: laser light, projection effects, computer graphics, and kinetics. This allows them to replicate and repeat the objects of art design, which expands the boundaries of public art, the scale of its social significance.

Often, in its desire for experimentation and search, art design opposes itself to the traditional purpose of art - to reflect reality. Following Marcel Duchamp, the first to show the public the universally recognized objects with a “new look” (art design, as if embodying the daring dreams of the pioneers of avant-garde art about rebuilding the world) was Jean Tinguely. Back in the 1970s, he designed complex moving sculptures - mechanisms in which he ironically interpreted the realities of modern life, and Christo Yavasheva, an artist at the turn of the 20th and 21st centuries, packed the Reichstag, the New Bridge in Paris, the fountain and ancient buildings in Spoleto, concentrating attention on himself, taking away the uniqueness and individuality of historical buildings, «packaging» as if discredits their cultural value, replacing it with its own aesthetic significance. Anish Kapoor, a minimalist artist from India, became famous for creating amazing streamlined forms of strange sculptures in the Cloud Gate project, the bewitching volumes of which are like the fluid clock of Salvador Dali. In the light objects in the central part of Rotterdam in the Netherlands, the architect Adrian Goetz especially acutely combined design with the organization of object saturation of space. There, on the theater square, transformer lanterns are installed, more similar in shape and size to the construction cranes of the seaport, made of metal, they have become the dominant of the square and iconic objects. Exaggerated art forms have become rather objects of art design, exceeding the height line of the surrounding boring buildings, they organized the stage space. An example of a city square solution can also be called the “Blue Carpet” of Heatherwick Studios in the UK in 2002. Here, the surface of the square itself, made from slabs of recycled bottle glass with the addition of resin, served as a topic for ideas. In some places, the surface is distorted and turned inside out, forming benches and places for lanterns and trees. A technique is often used when that part of the urban space that has always been the most similar is taken and accentuated as a basis, and completely new or deceptive properties are given to the material used, such as the use of glass on the surface of a lawn, creating the effect of a water surface, this is due to the need to illuminate the premises, located underground. There is another example, which is more designed for a conceptual approach, when the shape of its foundation is laid out in a different color on the site of a destroyed house, as a monument to something that does not exist. It is barely visible to the viewer, because this approach is designed for a certain distance from the place itself. But this is an example of a rather landscape solution for urban space. A couple of decades ago, an undisguised form was itself the object of decoration itself and did not need additional frills. But now, the simple skeleton of the form is no longer interesting, its minimalism is known and does not evoke any emotions. Designers and architects have to find new options for the golden mean. Thus, purely functional objects, such as ventilation ducts, blocks, pipes that appear in unplanned places, are transformed into objects of ur-

ban art, which are objects of art design. So the need for underground ventilation made it possible to create another such object by the Heatherwick studio, which appeared in London not far from St. Paul's Cathedral. The shape of the valves is a folded A4 sheet and enlarged from a three-story house. Each tower is welded from triangles and twisted in such a way that it does not require any additional reinforcement.

The key aspects of the visual enrichment of the urban environment in the last quarter of the 20th century are “the desire to switch the viewer's attention to the meaning, to the meaning of what is depicted or presented. Introduced by modern art historians following the artists, the opposition “conceptual-plastic” indicates that the supporters of the direction under consideration no longer make plastic expressiveness, the architectonic coherence of the elements of form, the main content of a work of art” [7], but consider all properties together.

According to one American artist, the founder of conceptual art, J. Kossuth, the 20th century is entering a period that can be called the end of philosophy and the beginning of art, but art, understood in a fundamentally unconventional way.

What is the similarity and what distinguishes the past of the late 1950-1960s and modern searches? V.S. Turchin defined it this way: “Mythologization of reality disappears, because pop art created its own legend... Where there was a «collaboration» of material and image, only materials remained, however, processed with an unprecedented design approach» [8].

Summing up, we can say that the central method of organizing the architectural and artistic environment of the city at the end of the 20th and beginning of the 21st centuries was the integration of functional, conceptual and technological concepts based on a kind of symbiosis of past and modern avant-garde searches for spatial art forms, the originality of the use of technical means, the declaration of modern artistic trends that do not fit into the traditional forms of public art. The conditionality, the illusory nature of the created space and the artistic objects themselves are noted, in which the design properties become predominant. V.A. Gavrilov in his work “Plastic Innovations in the Sculpture of the 20th Century” especially notes that “sculpture-design”, which occupies an increasingly prominent and significant place in the modern cultural space, becomes a feature of the turn of the epochs [9].

The interpretation of the architectural and artistic urban environment of the second half of the 20th century is inevitably associated with the philosophy of the postmodern era, it can also be characterized as intertextual, without a universal language, but as an expression of sensual energy oriented towards elite and mass culture at the same time.

The leveling of the artist's personality contributes to the fact that the objects of art belong more to the space and the viewer than to their creator. The role of the spectator, thus, becomes one of the main components of the modern architectural

and artistic process, the main goal of which is to involve this spectator in a creative dialogue between the object of art and the environment.

Thus, the modern architectural and artistic concept strives to embody the principle of interactivity, in which the role of an intermediary between the viewer and the environment is called upon to play the objects of art design, which have become a concentrate of innovative representativeness of form and content.

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巴赫奇萨赖保护区历史、文化和考古博物馆收藏的克里米亚鞑靼妇女头饰的装饰研究

**ORNAMENTAL STUDIES OF THE CRIMEAN TATAR
WOMEN'S HEADRESSES FROM THE COLLECTION OF
THE BAKHCHISARAY HISTORICAL, CULTURAL AND
ARCHAEOLOGICAL MUSEUM OF THE RESERVE**

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抽象的。 本文介绍了对巴赫奇萨赖历史文化保护区库存中的一组织物的研究结果。 文章作者试图科学地将克里米亚鞑靼头巾的装饰归因于装饰性编织和刺绣技术。 科学文献中从未描述过的装饰图案首次被引入科学界。

关键词。 头套, 克里米亚鞑靼人, 刺绣, 编织, 装饰。

Abstract. *The article presents the results of a study of a group of fabrics from the stock collection of the Bakhchisaray Historical and Cultural Reserve. The author of the article made an attempt to scientifically attribute the ornaments of the Crimean Tatar head coverings in the technique of decorative weaving and embroidery. For the first time, ornamental motifs that have not been previously described in the scientific literature are introduced into scientific circulation.*

Keywords. *Head cover, Crimean Tatars, embroidery, weaving, ornament.*

A rich ornament developed over many centuries is one of the features of the Crimean Tatar decorative art. Its creators and keepers were women who passed on their knowledge and skills from generation to generation. At present, the task of preserving the material heritage that carries knowledge about the life and art of our ancestors, the study and popularization of cultural heritage monuments are museums. One of such museums, which keeps the most extensive collection of ethnographic items of the Crimean Tatars, is the Bakhchisaray Historical and Cultural Reserve.

During 2014-2015 the author, together with the senior researcher of the museum S.N. Abduramanova conducted research on the study of a group of fabrics related to women's head coverings. 42 items (17 woven marama and 25 embroi-

dered sherbenti) of the late 19th–early 20th centuries, which came to the museum from the time of its formation, were examined. The inventories of the above-mentioned products were entered into the Inventory Books, which were repeatedly rewritten. At the same time, new inventory numbers were assigned to the exhibits, descriptions were shortened, the names of ornaments that could not be translated, and sketch diagrams were deleted. During subsequent censuses, the names of the masters, the areas of existence of objects, etc., were lost, descriptions were greatly reduced. In the course of studying the Inventory Books, detailed legends of some products were restored, sometimes - the places of their manufacture, the names of embroiderers, owners. The studied women's head coverings have an extensive geography. These are various areas of Crimea - the city of Bakhchisaray, the village of Simeiz, the village of Tiberti, as well as Romania and Uzbekistan.

In the course of examining the exhibits and working with accounting books, in order to determine the most accurate translation of the Crimean Tatar names, we used dictionaries of ancient Crimean Tatar words. As a result, the names and translation of some ornamental motifs, new names for the seams of gold embroidery, and execution techniques were determined. In the process of research, the authors drew attention to the ornament of three head covers with an identical anthropomorphic ornament of varying degrees of stylization. Two bedspreads were received by the museum from residents of Bakhchisarai (No. 10607/977 and No. 11168/1064) in 2007 and 2010. and one from the Vienna Museum of Ethnography (No. 11060/1005) in 2019 (ill. 1).

The ornamental motifs on the two head covers are made in two alternating colors - black and white. In our opinion, these ornamental motifs are of varying degrees of stylization with images of the Goddess of the Mongol-Turkic world Umai (Umai-ana) - a female deity, the patroness of children and mothers, whose veneration was based, according to L.P. Potapov, the obvious connection between the birth of a child and the maternal principle. The word umai means “womb, afterbirth, umbilical cord” [1]. Among modern Turkic peoples (Kyrgyz, Kazakhs, Altaians, Khakasses, Crimean Tatars, etc.), according to popular beliefs, various states of children are associated with the actions of Umay-ana - her presence or absence near the child. V.G. Kotov recorded two varieties of the deity - White and Black Umai, one gives life, and the other takes it away [2]. The Shors also had ideas about Kara-Umai, an evil spirit that was associated with the illness and death of children. Umai is not only the patroness of women in childbirth and children, but also the angel of death, who takes away the soul of the dying.

The appearance of the Goddess Umai among many peoples is represented as a beautiful woman in rich clothes. Its symbolic attributes are a three-horned head-dress (crown), an arrow with a three-beam tip (the pantheon of the ancient Altaians), a small cup where the souls of children (the Turks of Siberia) were placed

in consecrated milk. Among the peoples of Altai, Central Asia, Kazakhstan, it appears as a fabulous bird that supposedly nests in the air. In the sacred texts of the Altaians, Umai is called the “mother bird”, in the Arabized world - “Humai” - the swan maiden, the bird of happiness [3], the Turks of Siberia, the Shors represent her as a beautiful woman with golden hair and wings, descending from the sky [4].

Comparing the semantics and folklore ideas of the Turkic peoples about the goddess Umai, the ornamental motifs on the above Bakhchisarai maramas can be identified as her stylized images, on which you can see a three-horned crown on her head, wings and an arrow behind her back with a triple tip. An eight-petal flower in the lower part of the body is the womb of a woman, giving rise to a new life. The execution of ornamental motifs in two colors - black and white, can also mean white and black Umai (ill. 1). And, finally, the image of the goddess Umai on the head cover has a logical explanation: such marama could be worn by women who were somehow connected with babies (those who gave birth, lost, did not have children).

Also, as the image of the goddess Umai as “Mother Birds” or “Swan Maiden” (Humai), it is possible to identify another image on the head cover for No. 11024-995, in which there are such attributes as wings and a three-horned crown (ill. 2) .

The collection of the State Museum of Oriental Art (Moscow) contains a head cover (*tolu marama*) No. 2930 III, with large ornamental motifs along the edge of the canvas and small ones scattered throughout the field, which can also be identified as the motif of the goddess Umai, by analogy with Bakhchisaray specimens. L.I. Roslavtseva identifies the large motif depicted on it as a “stylized image of a hookah”, and the small ones as “snowflakes” [5, p.163], which, in our opinion, is erroneous. Marama is a head covering worn by a married woman most often when performing prayers, and placing an ornament in the form of a hookah on it does not make logical sense.

In the process of researching the collection of head covers, some names of ornamental motifs were discovered, clarified and translated into Russian. So, for example, an unknown embroidered ornamental motif on a head coverlet (sherbenti) No. 454/345 in the original inventory book was recorded by U. Bodaninsky as “*tutash-gul*” (ill. 3). The word «*tutash*», now obsolete and used in the Crimean Tatar language at the beginning of the 20th century, is translated as «comprehensive, all-encompassing» (I. Kerimov). The term «*gul*» means a flower - a rose. The ornamental motif is represented by a half-wave and a large rose flower alternating between themselves, embraced or embraced by many small elements (ill. 3). Thus, the motif can be interpreted as «a rose surrounded by many plants.» Similar motifs were found on five more exhibits.

By analogy with the “*tutash-gul*” motif, the ornamental motif presented on Sherbenti No. 476/367 was deciphered under the name “*tutash-ornek*” - “comprehensive ornament” (ill. 4). The motif fills the entire width of the product with an

extensive floral border with a complex composition, the core of which is a wave with large rose flowers. The ornament is complemented by two inscriptions embroidered in gold: «Embroidered in May» and «Memory of 1907». The coverlet participated in the Paris Exhibition of 1925, and after its completion was transferred by the Main Exhibition Committee to the Bakhchisaray Museum.

An interesting and unique ornamental motif is presented on a Crimean work of the late 19th century. for No. 628/516 (ill. 5). The ornament is made in the middle of the longitudinal edge and, when putting on the coverlet, falls on the frontal part of the head [6, l. 117]. The motif is represented by a schematic image of the crown - taj, in the center of which the inscription «Mashallah» is embroidered in Arabic script and is brought along the edge with a traditional «su» border of the «madohil» type. The embroidery is made with a silver-plated “tel” plate, which enhances the brilliance of the ornamental motif, giving it solemnity and significance.

We also suggested the name of the ornamental motif on Sherbenti No. 10989-986 (ill. 6) - “kok kushagy” (rainbow). The shape of the rainbow in the Crimean Tatar ornament, as a rule, is represented by three or five concentric circles inscribed one into the other, or half a circle, and is indicated by the main colors: red, yellow (gold), blue [7]. Since the motif presented on the sherbenti is made in the form of concentric semicircles of gold, red, yellow, and the leaves on the semicircles are blue, red and yellow, we suggested that this motif is a kind of rainbow image.

Thus, for the first time, a stylized image of the goddess Umai on woven head coverings marama, the names of ornamental motifs of the Crimean Tatar embroidery *tutash-gul*, *tutash-ornek*, *taj*, *kok kushagy* were introduced into scientific circulation. This study was carried out for the first time and formed the basis of the catalog of women’s head covers from the funds of the KRU «Bakhchisarai Historical and Cultural Reserve».

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Figure 2. A stylized image of the "Khumi" motif (Goddess Umai as "Mother Birds") on the Crimean Tatar head covering of the maram. Weaving.



Figure 3. Ornamental motif "tutash-gul" on the Crimean Tatar head cover sherbenti. Crimean Tatar bilateral expanse.



Figure 4. Ornamental motif "tutash-ornek" on the Crimean Tatar head cover sherbenti. Crimean Tatar bilateral expanse.



Figure 5. Ornamental motif "taj" on the Crimean Tatar head cover sherbenti. Tellyu embroidery



Figure 6. Ornamental motif "kok kushagy" on the Crimean Tatar head cover sherbenti. Crimean Tatar bilateral expanse.

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价值观作为文化的意义建构元素
VALUES AS THE SENSE-MAKING ELEMENT OF CULTURE

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抽象的。 文章认为,对深植于普通意识中的“价值”和“意义”概念内容的认同,是价值论问题变得琐碎化的根源,并最终导致知识脱离了对具体事物的理解。 值是什么类型的实体。 有两组不同的社会文化对象由同一个术语“价值”命名:人类存在感和重要物品。 无论我们继续将这些不同的对象中的哪一个标记为“值”,都不会让它们变得相似。 任何重要的善都无法在文化中发挥真、善、美的作用,作为人类存在的最终目标。

关键词: 价值论、价值、意义、真、善、美、价值关系、价值取向。

Abstract. *It is asserted in the article that identification of the content of the notions “value” and “significance”, deeply rooted in ordinary consciousness, is the source of trivialization of axiological problems, and, ultimately, leads the knowledge aside from understanding of the specific kind of entities which values are. There are two different groups of socio-cultural objects named by one and the same term “values”: senses of human existence and vital goods. No matter which of these different objects we would continue to sign as “values” it does not make them similar. No any vital good can play in culture the role of Truth, Good and Beauty as ultimate objectives of human existence.*

Keywords: *axiology, values, significance, truth, good, beauty, value relation, value orientation.*

Everybody now speaks and writes about values.

In ordinary consciousness under the term “value” one can mean any cultural or even natural object which has some significance for this one. Some people name the “value” their children, and others – their dogs or cars.

It follows that there is really endless number of “values”, because everything, somewhere, someday, to some subject of culture may have some significance.

All this talking is not interesting as a subject for philosophical studies, and has never been, because axiology – the theory of values – has another origin.

There is a long tradition in philosophy to differ things useful to animal vitality of man from that which work for the development of his moral (social) qualities.

In the ancient Epicurean and Stoic tradition everything that has nothing to do with the growth of reason and Logos: *life and death, glory and infamy, work and pleasure, wealth and poverty, illness and health* – was called the term “*adiaphoria*” and was ranked among the sphere of man’s indifferent social existence.

We can say that 2 millennia before the introduction of the term “value” (which was introduced only in 30th of 19th century) ancient philosophers predicted two main theoretical problems of axiology.

The first one: Is the set of all objects that are significant for a person homogeneous? And the second one: Is among significant objects a subset that has special functions in culture?

2 millennia later the neo-Kantians answered “NO” to the 1st question and “YES” – to the 2nd one.

As the real founders of axiology the neo-Kantians linked values with the meaning of human life and showed that values answer to fundamental questions about ultimate objectives of human culture. They developed the idea of a special status of values in the structure of human spiritual world and differed values and forms of their embodiments.

Knowing all this we might ask: Why such a primitive idea of values as everything that have some significance for people is dominated today in axiology and public opinion?

F.Nietzsche answered to this question straight and clearly: will to power lays under this primitive idea of values.

It should be noted that Nietzsche did not invent this understanding of values. Being one of the greatest philosophers in history he just expressed the main tendency of Western European culture.

Now we could see that the leading trend in Western European axiology since the time of Nietzsche includes:

- nihilistic attitude towards everything that goes beyond the vital goods determined by the subject himself;
- identification of values with any standards of preferences;
- formation of “lists of values” for every taste;
- blurring of the line between what is due and what is not;
- aggressive imposition of physical and moral deformities as forms of manifestation of “freedom”.

In my opinion, nothing testifies the will to power and domination like the renunciation of Truth. Only an all-consuming will to power can give rise to the crazy idea of “multitude of truths” and values as “standards of preferences”.

Postmodern idea of “many truths” as the quintessence of pseudo-value rhetoric means that everyone can say whatever he wants, regardless of anything that goes

beyond his own consciousness: some believe that the Earth is spherical, and that there are only two genders; others believe that the Earth is flat, and there can be an indefinite number of genders.

What follows from this trend of modern axiology for everyone who wants to have one's own opinion about values?

The answer of philosophy for such questions is one and the same for ever: we should think. To make our thinking reasonable we should ask our selves some methodological questions, such as:

- Why different phenomena of human life are not called by their own names: preferences, goals, priorities, norms, ideals, and so on?
- What do we want to indicate by calling our preferences “values”?
- Do we really understand the logical consequences of identification of value with simple significance?
- Is it possible to include in one row Truth and true idea, Beauty and beautiful objects, Good as opposite to evil and norms of etiquette?
- What does it mean to be in value relation to the world?

It seems to me that the value relation to the world represents the last link in the chain of reasoning adopted in human culture. In other words, the value relation to the world plays in culture as determination of the borders and ultimate objectives of human life; as understanding of the ultimate meaning coordinates of socio-cultural world the name of which is “values”; as realization of a special kind of estimation: estimation of the foundations of value judgments and as establishing of the very grounds of evaluation or standards of any possible standards.

It follows that **to be the value** means: to be an element of the realm of ultimate objectives and meanings of human culture; to accumulate in itself an inexhaustible and indestructible cultural Sense that one can join at any point of the physical space and in any moment of historical time; to carry in itself some spiritual content which can be embodied in any purpose not contrary to the socio-cultural nature of man (Chernyakova, 2020, p. 369-380).

Whatever may have any significance for people, Truth, Good and Beauty have it in any case.

It is not the matter of the difference in people's opinions; it is the evidence of unavoidable facts of their life. An introduction of additional determinations, such as “inherent”, “fundamental”, “basic”, etc. of Truth, Good and Beauty makes it inevitable that the special status of them in the realm of Sense cannot be reduced to a simple social significance.

Truth is a value, because there is an objective world which people want to know as it is in itself.

Beauty is a value, because in this world, which people want to know as it is in itself, there is a harmony which they delight.

Good is a value, because people themselves can exist in the world, which they want to know and the harmony of which they delight, only confirming themselves just as human, but not animal beings.

In order to receive some socio-cultural significance all the goals of human activity and cultural phenomena must be evaluated on the grounds of Truth, Good and Beauty as three sense-coordinates of the cultural world.

Value orientation of the subject of culture is a concrete form and way of embodying values. Since nothing can become an absolute embodiment of values, value orientation indicates only the phenomena that are considered by a subject of culture as real embodiments of Truth, Good and Beauty and the means authorized within the framework of this culture to achieve value-meaningful results.

Truth, Good and Beauty are universal regulatives of human activity. They always orient people to the formation, development and improvement of themselves as subjects of socio-cultural activity (Chernyakova, 2018, p. 683-689). No one can claim to have an exhaustive embodiment of Truth, Good and Beauty in human culture, so there cannot be the “final list” of value-content products of culture or cultural activities. Every subject of culture has specific forms of embodiment of values in their cultures.

In conclusion it should be said that identification of the content of the notions “value” and “significance”, deeply rooted in ordinary consciousness, is the source of trivialization of axiological problems, and, ultimately, leads the knowledge aside from understanding of the specific kind of entities which values are.

There are two different groups of socio-cultural objects named by one and the same term “values”: senses of human existence and vital goods. No matter which of these different objects we would continue to sign as “values” it does not make them similar. No any vital good can play in culture the role of Truth, Good and Beauty as ultimate objectives of human existence.

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气质类型的创新观点：科学假设
**AN INNOVATIVE VIEW OF TEMPERAMENT TYPES: A
SCIENTIFIC HYPOTHESIS**

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抽象的。根据心理学家的实践观察，由于成功的心理援助、纠正和治疗，“乐观”气质的稳定占主导地位。

关键词：气质类型，乐观的人，心理规范，心理学，心理治疗，心理实践。

Abstract. *Observations from the practice of a psychologist of changes consulted to a stable dominant type of temperament “sanguine” as a result of successful psychological assistance, correction, therapy.*

Keywords: *temperament type, sanguine person, psychological norm, psychology, psychotherapy, psychological practice.*

The main conceptual idea of my scientific hypothesis is that as such types of personality temperament do not exist in their classical interpretation: sanguine, phlegmatic, choleric, melancholic.

In psychological science, the term “temperament” (lat. temperamentum - “stable mixture of components”) is understood as “a stable set of individual psychophysiological characteristics of a person associated with dynamic, rather than meaningful aspects of activity” (1). By itself, temperament determines the specifics and features of the formation and consolidation of behavioral personality traits, its characterological components. Psychophysiology also describes and scientifically proves the fact that the type of temperament depends directly on the type of higher nervous activity, manifested in sensitivity, activity, and in the features of perception of the surrounding reality in the stimulus-reactive space.

The word “temperament” is analogous to the meaning of the definition by the Greek word “krasis” (ancient Greek κράσις, “fusion, mixing”), which was used by Hippocrates and Galen. Even then, in search of truth, thinkers tried to cognize and structurally describe the personality of a person, based on the consideration of the presence of stable features and characteristics of a person.

I consider the temperament types *phlegmatic*, *choleric*, *melancholic* (described by Galen as the founder of this conceptual classification, Carl Jung as the founder of the concept of personality types in psychological science and other researchers) as a *psychological disorder within the framework of normative indicators of mental health*.

Normativity is determined by the fact that in the presence of certain characteristics of manifestations, in general, the ability to think and act adequately to situations (the ability to think logically and control one's emotional-volitional sphere to a sufficient extent) is retained, as well as to function socially.

But the types of temperament phlegmatic, choleric, melancholic are the fore-runner of a high probability of the occurrence of mental disorders outside the normative boundaries of a healthy person, since in addition to the features that will be listed below, they are characterized by a rather low true (not socially expected) level of general *tolerance*.

As well as stress resistance, and for the description of the choleric and melancholic this is clearly observed, and for the phlegmatic it is characterized in the format of a kind of "emotional freezing".

And these two parameters are paramount for successful, effective personal adaptation (namely, the high level of PA was put at the head of understanding the health of the psyche by Sigmund Freud).

The stability of the manifestations of personality traits, in my opinion, is also determined by the presence of a long-term, persistent destabilizing state of a person. Factors that determine persistence and even stability (without obvious remissions in the development of the observed symptoms) may be: a traumatic situation in the family or in another social environment; insufficiency of the communicative-adaptive development of the personality, and as a result, incomplete "normal" socialization; physiological characteristics of the body, manifested by burdening the perception and reaction of the surrounding reality in accordance with the parameters of adequacy (certain psychological traits of the personality of a "sick person" are known and described, such as: irritability, anger, suspicion, anxiety, increased muscle tone, psycho-emotional stress, the formation of a "difficult" character ; or apathy, lethargy, connivance, psycho-physiological weakness, slow reactions, uncertainty, avoidance of failures and even avoiding active communication). As a result of the functioning of psychological defenses (Z. Freud), designed to reduce "pain for the soul", and not resolve the current situation in a positive way, the human psyche can be in a kind of "anabiosis" for years and even decades, which explains this very stability and resilience manifested outside of personality traits. As a result, we observe the fact that a "suit of a psychological type of temperament" is put on over our soul so that we live a little easier and more adaptively.

The question becomes - why then are 4 types described according to the classical approach and all of them are observable and recognizable? We all have something in common that makes us human: if we rejoice, our eyes glow, “burn”, a smile crowns our face; if we are sad or in pain, we cry, scream, we have a down-cast look, an “extinct” look; if we feel calm and satisfied - our movements are precise, smooth, light, the muscles of the body are sufficiently relaxed and we can make right, reasonable decisions and utter deep thoughts. The basis for our emotional experience is our thoughts about a particular situation, refracted through the opinion of significant people for us (parents or persons replacing them; friends, authorities) and our own experience of interacting with the world (whether the world is perceived by us positively, negatively or neutral and tolerant).

Ask yourself - why only a sanguine person feels happy enough?

The choleric drives himself with the constant «run of the day», the phlegmatic does not have enough strength to realize important goals and dreams for him, and the melancholic correlates between «light» and «dark» sadness, sometimes reflecting on the futility of being.

Also, my vision is proved by the fact that within the framework of child psychology, the type of temperament «melancholic» is not normative and indicates the experience of a traumatic experience or a violation of the functioning of the central nervous system.

In my psychological practice, I invariably observe quite interesting facts:

- with neuroticism, personal anxiety, «panic attacks», aggressiveness, the personality manifests the type of temperament «choleric»;
- with learned helplessness, avoidance of failures, low self-esteem, apathy, low motivation - «phlegmatic»;
- with prolonged, chronic depression - «melancholic»;
- as a result of harmonization and stabilization of the psycho-emotional state, «coping strategy» for resolving internal and external psychological conflicts, cognition and awareness, acceptance and positivity of the «true self», a person’s personality acquires a type of temperament - «sanguine».

Even Carl Jung, in his works on the classification of personality typologies, emphasized a certain approximation and relativity of these descriptions, since each person is unique, inimitable, and, in my opinion, even unknowable, as an image of a labile, changing in its development, Universe.

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自闭症谱系障碍儿童的心理和心理生理特征综述
**A REVIEW OF PSYCHOLOGICAL AND
PSYCHOPHYSIOLOGICAL CHARACTERISTICS OF CHILDREN
WITH AUTISM SPECTRUM DISORDER**

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抽象的。 本文分析了自闭症谱系障碍儿童的心理和心理生理特征。 这项工作包含对自闭症谱系障碍儿童情绪识别细节研究的理论回顾，对情绪智力的遗传和心理生理相关性以及在呈现人的计算机图像时识别基本情绪的研究的回顾；证实了一项实证研究，旨在确定由于遗传特征而识别自闭症谱系障碍儿童基本情绪的大脑机制。 该论文描述了患有自闭症谱系障碍的儿童发育过程中的言语、沟通、智力和感知异常。

关键词：自闭症谱系障碍、心理特征、基因、情商、情绪识别。

Abstract. *The paper analyzes the psychological and psychophysiological characteristics of children with autism spectrum disorder. The work contains a theoretical review of studies on the specifics of emotion recognition in children with autism spectrum disorder, a review of studies on the genetic and psychophysiological correlates of emotional intelligence and recognition of basic emotions upon presentation of computer images of persons; substantiation of an empirical study aimed at identifying the brain mechanisms for recognizing basic emotions in children with autism spectrum disorder due to their genetic characteristics. The paper includes a description of abnormalities speech, communication, intelligence, and perception abnormalities in the development of a child with autism spectrum disorder.*

Keywords: *autism spectrum disorder, psychological features, genes, emotional intelligence, emotion recognition.*

Introduction

The ability to recognize emotions and emotional intelligence are of great importance in social interaction, in learning, in building harmonious relationships with people around them and in a career (Chakrabarty R. et al., 2008; Sánchez-Álvarez N. et al., 2020; Goh E. et al., 2020). Emotional intelligence is understood as the ability to correctly recognize and express one's own and other people's emotions, as well as to control the manifestations of one's emotions (Kosonogov et al., 2019). Emotional contact and social interaction disorders are considered central features of autism spectrum disorder (Welsh et al., 2018; Hyman S.L. et al., 2020; Kodak T. et al., 2020; Genovese A. et al., 2020). It is known that for children with development corresponding to the normative, from a very early age there is a focus on the establishment of social interaction.

Autism spectrum disorders are understood as a nosologically heterogeneous group of diseases, which include Kanner's children's evolutionary-procedural autism (F84.0), infantile psychosis (F84.02), non-psychotic evolutionary-constitutional autism with Asperger's syndrome (F84.5), atypical childhood psychosis (F84.11) and other types (Lord et al., 2018; Simashkova et al., 2019). Autism Spectrum Disorders are characterized by significant impairment in communication, interaction, difficulty recognizing emotions, limited interests, and stereotypic behaviors (Bours C.C.A.H. et al., 2018; Mughal S. et al., 2022). The incidence of autism spectrum disorders has steadily increased in recent years and currently stands at 1 in 36 people (Sharma et al., 2018). In people with autism spectrum disorder, there are signs of foci of neuroinflammation in the brain parenchyma, while there may be an increased level of interleukin-1, acute phase proteins (Saad et al., 2020). Children with autism spectrum disorder also have other abnormalities, such as those responsible for vascular permeability (Pease-Raissi et al., 2018).

There are three main groups of abnormalities that can be used as diagnostic criteria for autism. Abnormalities in mutual interaction can include inability to appropriately use eye contact and maintain it, as well as use facial expression and body gestures to operate in social situation; inability to establish and maintain relationships with people of the same age; abnormal reaction to other people which results in lack of social and emotional dependence on them and inability to correct one's behavior in accordance with the social situation; inability to have shared interests or experiences with other people. Communication abnormalities can be manifested in: abnormalities in ontogenetic development, such as absence of cooing as form of communication in early stages of speech development, followed by delay or complete absence of spontaneous speech without individual's attempts to substitute it with body gestures and facial expressions in later stages; lack of ability to initiate or maintain a conversation in any moment of speech development; repetitive and stereotyped speech; inability to engage in imitative play

at an early age, later stereotypical role play, lack of variety in it. Individual may exhibit restricted, repetitive, and stereotyped behavior, interests, and activities which could include commitment to stereotyped and restricted interests. Specifically, this is manifested in the presence of attachment, which can be seen as obsessive, to meaningless actions and rituals; stereotyped and repetitive movements; heightened interest in certain characteristics of an object, such as smell, texture, sound, or vibration. Beside the communication and behavior sphere, there are also can be seen abnormalities in perception. Children with ASD have uncharacteristic responses to stimuli of different modalities, specifically to auditory ones. They demonstrate either hypersensitivity to certain sounds or total ignorance of other ones. Visual stimuli which considered to be significant to neurotypical children such as parent's faces do not have the same response in children with ASD. This selectivity of stimuli is associated with later development of social sensitivity. Children with ASD also have a disturbed understanding of self. (Manelis, 1999).

Children with autism spectrum disorder may have difficulty in recognizing faces, as well as in expressing their own emotions, emotional coloring of speech. Presumably, this may be due to disturbances in the functioning of mirror neurons (Rizzolatti, 2016; Huggins et al., 2020). Emotional intelligence is often the target of psychocorrectional interventions in children with autism spectrum disorder (Sharma et al., 2018).

Neuropsychological studies of children with autism spectrum disorder have shown the presence of functional insufficiency of the occipital regions of the right hemisphere, poorly formed interactions between the centers of the right and left hemispheres of the brain, as well as unexpressed specialization of the hemispheres and dysgenetic syndrome, in which the upper brainstem disorders play a central role (Cambier, 2016). Theories explaining the origin of autism link it to mirror neurons. Disorders of the mirror neurons of the insular and anterior cingulate cortex in autism carriers may be associated with their inability to empathize (Neta et al., 2016). In children with autism, connections between a subcortical center such as the amygdala and sensory areas of the cerebral cortex are disrupted, which can manifest itself at the behavioral level as unusual emotional reactions. In addition, children with autism spectrum disorder may have an increased average density of neurons in the prefrontal cortex (Chen et al., 2021; Fische-Gomez et al., 2021). Literary sources describe the neural mechanisms of attentional disorientation in children with autism spectrum disorder (Stroganova et al., 2015). Studies carried out using the electroencephalography method have shown that in children with autism spectrum disorder, the synchronization of the hemispheres is impaired, which determines their specific characteristics of the perception of the world around them (Fiebelkorn et al., 2013; Welsh et al., 2018). Children with autism spectrum disorder upon presentation of computer images of persons have been found to exhibit atypical emotional processing compared to control children (Leung et al., 2018).

The results of a study of children with autism spectrum disorder who have evolutive and psychotic forms of this disorder, as well as children with autistic symptoms in genetic diseases, indicate that there are features of the rhythmic components of the electron cephalogram in different forms of autism spectrum disorder. Thus, the greatest changes were noted in such a severe form of autism spectrum disorder as atypical childhood psychosis in the clinical stage of regression. At the same time, on the electroencephalogram in seventy percent of patients, the dominance of rhythmic theta activity and a significant decrease in the power of the alpha rhythm were observed. With such a form of autism spectrum disorder as infantile psychosis with catatonic disorder, in 78% of children during an attack, the organized nature of the electrical activity of the brain with a regular alpha rhythm remained, and during the period of remission there was a pronounced mu rhythm, the power of which significantly exceeded the age standards. With this form of autism spectrum disorder as highly functional Asperger's syndrome in children aged three to four years, there was a significant increase in the spectral power of the high-frequency components of the alpha rhythm. A delay in the formation of the alpha rhythm was found in Kanner's syndrome (Simashkova et al., 2019). Studies of the electrical activity of the brain of children with autism spectrum disorder have shown the presence of an increased intensity of theta rhythm compared to the norm (2008; Pop-Jordanova et al., 2014; Devitt et al., 2015). The expression of beta and gamma EEG components in children with autism spectrum disorder is increased compared to the normative ones (van Diessen et al., 2015; Wang et al., 2020). In children with autism spectrum disorder, neural connections are formed and subsequently function differently than in healthy children (Kana et al, 2014; Emerson et al., 2016). Carriers of autism spectrum disorder have an increased brain volume, there are disorders that are associated with the somatosensory cortex, visual cortex and subcortical regions of the brain (Hazlett et al., 2017; Chen et al., 2015). Children with autism spectrum disorder have abnormalities in the microstructural organization of the corpus callosum, which are associated with difficulties in hand-eye coordination (Bellani et al., 2013).

Twin studies have shown the presence of a pronounced hereditary component in the phenotypic dispersion of autism, genetic studies indicate the contribution of a sufficiently large number of genes to the hereditary condition of autism, as well as the presence of an epigenetic component. Genome-wide analysis allows us to identify loci associated with autism, the number of which reaches 1000 (Ramaswami et al., 2018; Hegarty et al., 2020; Imamura et al., 2020). In particular, data have been obtained on genes that control the synthesis of postsynaptic proteins, such as L-type calcium channels and proteins involved in N-methyl-D-aspartate signaling (Morimoto Y. et al., 2021).

A number of studies have shown that carriers of different genotypes for the Val158Met polymorphism of the COMT gene differ in the speed, accuracy, and

success of emotion recognition (Zhu et al., 2012; Vorobyeva et al., 2020). The main function of catechol-O-methyltransferase is to regulate the level of monoamines in the prefrontal cortex of the brain, which is involved in the implementation of adequate social behavior, planning, abstract thinking, emotions and working memory. One of the hypotheses of the pathogenesis of autism associates it with dysfunction of the dopaminergic system of the midbrain, while in children with ASD, an association with the Val/Val genotype for the COMT Val58Met polymorphism, abnormal dopamine levels and an electroencephalogram, and an increase in the severity of autistic behavior were found (Esmail N.N. et al., 2020).

Serotonin type II receptor gene HTR2A. It is known that the G / G genotype for the rs6311 G> A polymorphism, as well as the C / C genotype for the rs6313 C> T polymorphism, are associated with a decrease in the density of type II serotonin receptors on the postsynaptic membrane of the neuron. In research, devoted to the study of the features of recognition of emotionally colored visual scenes by carriers of different genotypes of the HTR2A gene, it was shown that the evoked brain activity of people with a high density of serotonin 2A receptors (T/T genotypes for the rs6313 polymorphic locus and A/A for the rs6311 polymorphic locus) is characterized by a pronounced negativity in the parietal-occipital areas in the period of 350-420 ms after the presentation of an emotionally charged scene (Vorobyeva et al., 2020).

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青春期学生运动员夜间睡眠时间及其对体能的影响

**THE DURATION OF NIGHT SLEEP AND ITS INFLUENCE ON THE
PHYSICAL PERFORMANCE OF STUDENT-ATHLETES OF THE
PERIOD OF ADOLESCENCE**

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抽象的。在秋明市专业大学就读的具有俄罗斯体育硕士运动资格的年轻人的夜间睡眠时间对身体表现的影响研究中，睡眠问题的调查结果 联合会，体育硕士和第一体育类别的候选人被提出。研究表明，夜间睡眠时间对身体机能有着显著影响，尤其是睡眠时间为9小时的年轻男性。运动员的资格越高，身体表现水平就越高，无论晚上的睡眠时间长短如何。

关键词：夜间睡眠，学生，身体表现。

Abstract. *The results of a survey of sleep problems in the study of the effect of the duration of night sleep on the physical performance of young men studying in specialized universities in the city of Tyumen, who have the sports qualification of a master of sports of the Russian Federation, a candidate for a master of sports and the first sports category, are presented. It is shown that the duration of night sleep has a significant effect on physical performance and more in young men*

whose sleep duration is 9 hours. The higher the athlete's qualification, the higher the level of physical performance, regardless of the duration of the night's sleep.

Keywords: *night sleep, students, physical performance.*

*«Who knows the secret of sleep, knows the secret of the brain»
Michel Marcel Jouvét*

Relevance. Due to the fact that modern students are a powerful labor and defense potential of our country, any research on the study of the hygienic state of their health is a priority and important for the state. The role of night sleep in human hygiene plays one of the most important components of the state of health of functional systems [3, 10, 14, 17, 20, 29]. Modern scientific research addresses various issues related to the impact of sleep hygiene, including student performance [4, 6], physical performance [5, 19, 24], anxiety level [9], and heart rate variability [22]. Sleep hygiene is the subject of literature reviews [7, 8].

Constantly discussed in the pages of special periodical literature are issues related to night sleep in athletes [1, 16, 21].

It can be concluded that the problem of night sleep in people of different ages and gender and its impact on the human body has always attracted the attention of specialists in various fields [12, 23]. Prominent Russian physiologist Academician I.P. Pavlov considered the study of the problem of the nature of sleep to be one of the key ones in the study of human higher nervous activity, defining sleep as “a process of diffuse cortical inhibition” [18].

The International Association of Sleep Medicine reports that about 35% of adults of working age do not consider their sleep to be sufficient [44].

Assessment of the level of physical performance (PP) is a priority area of sports medicine, for which various methods are used [2, 11, 15, 25, 26, 27, 38, 42].

Purpose: to assess the PP in young athletes of specialized universities in the city of Tyumen, depending on the duration of night sleep.

Organization, material and research methods. To assess the quality of sleep, we have developed a questionnaire that includes an analysis of the problems associated with the health of young athletes, depending on the duration of night sleep.

The assessment of the level of PP was carried out according to the step test PWC 170 V.L. Karpman in 36 young men aged 18.47 ± 0.93 years, who are students of three specialized universities in the city of Tyumen, who have a sports qualification of the first (1 p) sports category (21), a candidate (CMS) for a master of sports (9) and a master of sports (MS) of RF (6), specializing in cross-country skiing, biathlon, martial arts, kettlebell lifting and athletics. The duration of night sleep in 7 young men was 9 hours, in 10 - 8 hours, in 8 - 7 hours, in 6 - 6 hours and in 5 students - 4-5 hours.

The principles of voluntariness, the rights and freedoms of the individual, guaranteed by articles 21.2 and 22.1 of the Constitution of the Russian Federation, as well as the Order of the Ministry of Health and Social Development of Russia No. 774n dated August 31, 2010 «On the Council on Ethics» were observed. The study was conducted in compliance with the ethical standards set forth in the Declaration of Helsinki and the Directives of the European Community (8/609EC) and with the oral consent of the students.

Results and discussion. Analysis of the students' answers to the questionnaire (Table 1) testified that the higher the sports qualification of young men, the better the psychosomatic state. It is noteworthy that 9 (42.8%) young men with a sports qualification of the first sports category complain of poor falling asleep, and 11 (52.4%) of poor awakening and 8 (38.1%) of irritability. First of all, we associate these problems with the individual functional characteristics of the youthful organism, relatively low sports qualifications and social and living conditions. As for the state of bradycardia, it, in our opinion, is due to the economization of central hemodynamics as a result of constant dosed aerobic physical activity.

Table1.
The most common health problems of students involved in sports

Signs	Master of Sport n – 6	Candidate Master of Sports n – 9	First sports category n – 21
Use of sleeping pills	–	1	4
Falling asleep at the same time	–	2	7
Getting up at the same time	–	2	7
Poor sleep	–	2	9
Bad awakening	–	4	11
Daytime sleepiness	–	2	7
Irritability	–	3	8
Tachycardia	–	–	2
Bradycardia	4	3	1
Dizziness	–	–	1
Headache	–	–	1
Noise in ears	–	–	1
Memory impairment	–	1	1
Increase in blood pressure	–	1	3
Lowering blood pressure	1	1	2
Woke up in the middle of the night	-	3	5
Dreams	3	7	17
Night sweats	1	1	3

Eating disorders	–	2	6
Heartburn, pain and bloating, nausea	–	2	3

Studies have shown that in young men, whose duration of night sleep was 9 hours, the RF was equal to 1287.4 ± 19.7 kgm/min; 8 hours - 1258.1 ± 21.1 kgm/min; 7 hours - 1224.6 ± 22.3 kgm/min; 6 hours - 1189.5 ± 22.0 kgm/min; less than 6 hours - 1108.3 ± 24.7 kgm/min.

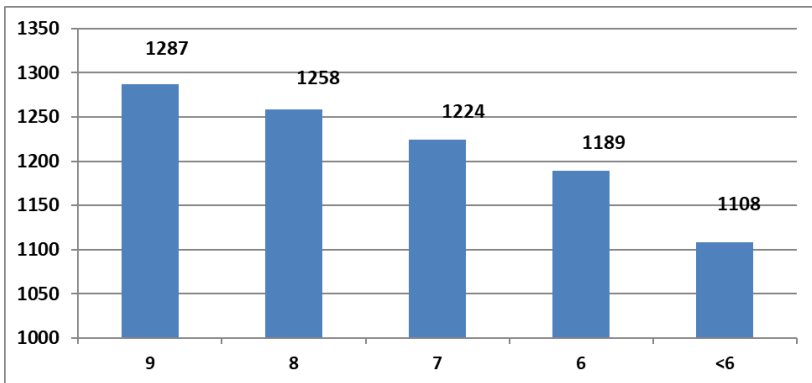


Figure 1. Indicator of physical performance of young students of universities in Tyumen, depending on the duration of night sleep.

Therefore, it can be concluded that PP is largely dependent on the duration of nocturnal sleep. Thus, the difference in the PP values between young men, whose night sleep duration was 9 hours, and their peers, whose night sleep duration was 8 hours, in absolute values is 29.3 kgm/min. It should be noted in particular that as the duration of night sleep decreased, the PP of young men decreased. Thus, in absolute terms, the PP index in young men, whose night sleep duration was 9 hours, in comparison with young men, whose night sleep duration was 6 hours, was 97.9 kgm/min, which is statistically significant ($p < 0.05$).

The minimum PP values were found in young men whose night sleep duration was less than 6 hours, while the difference in absolute values was 179.1 kgm/min, which is statistically significant ($p < 0.05$).

We concluded that the higher the athlete's qualification, the less dependence of his PR on the duration of night sleep. The results of the study showed that the masters of sports of the Russian Federation have a significantly ($p < 0.05$) higher PP, in comparison with young men who have the qualification of the first sports category (Fig. 2). The FR of the young men of the MS of RF was 1279.8 ± 18.6

kgm/min, the young men of the Candidate Master of Sports - 1238.6 ± 19.3 kgm/min, the young men of the 1st sports category - 1198.1 ± 17.9 kgm/min,

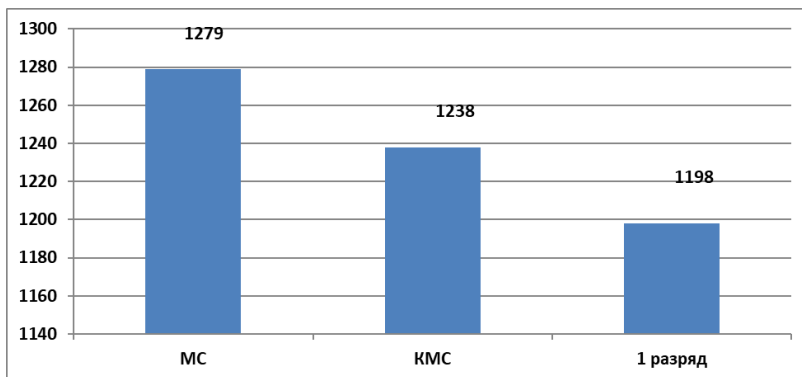


Figure 2. Indicator of physical performance of young students of universities in Tyumen, depending on sports qualifications.

We should agree with the opinion that if the duration of night sleep is less than 8 hours for a long time, the regenerating, i.e., positive effect of sleep on the body begins to decrease, but if a number of rules and recommendations are followed, it can be easily corrected [13].

There are reports indicating the beneficial effect of healthy sleep on the recovery of energy expenditure in athletes contributing to high sports performance [30, 31, 32, 34]. This is achieved due to the action of exogenous melatonin, which improves the condition of skeletal muscles [43], accelerating tissue regeneration in case of damage [40], increasing metabolism, strength and tone of tissues [39], which ultimately favorably affects their physical endurance by maintaining muscle and liver glycogen [36]. In turn, lack of sleep increases the risk of injury during exercise [28]. It is considered paradoxical that many athletes sleep less during intense physical activity, when they need sleep most of all, because the total sleep time falls below the minimum 7 hours [37]. Over 10 years ago Mah C.D. [41] convincingly showed that players on the Stanford University basketball team experienced a 9% increase in free throw and 9.2% increase in 3-point field goals when sleeping up to 10 hours.

We are inclined to believe that the speed of post-training recovery largely depends not only on the correct organization of training loads, but also on the choice of recovery means. We agree with the opinion [33, 35] that sleep for an athlete is not just a “rest” after the training process.

As for MOC, we did not find significant differences depending on the duration of night sleep. At the same time, the MOC is significantly higher among young men who have the qualification of the MS of the Russian Federation. Thus, the MOC in MS was 57.74 ± 1.98 ml/kg, in CMS boys - 54.39 ± 1.62 ml/kg, in boys of the first sports category - 51.26 ± 1.51 ml/kg (Fig. .3). Consequently, in MS, the MOC is higher by 3.35 ml/kg in comparison with the young men who have the qualification of CMS and have the first sports category by 6.48 ml/kg.

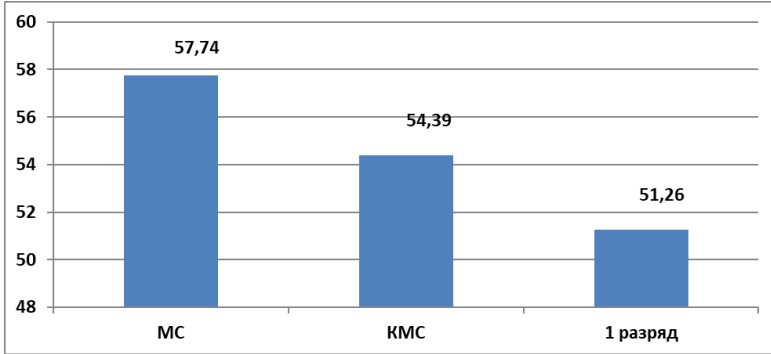


Figure 3. Maximum oxygen consumption among young students of universities in the city of Tyumen c., depending on sports qualifications.

Analysis of the survey, personal conversations with students and assessment of the level of PP in order to combat sleep disorders allowed us to formulate the following preventive measures:

- Rational mode of work and rest during the training process, going to bed and getting up at the same time, regardless of the day of the week. Don't go to bed until you feel sleepy.
- Do not drink alcohol. Limit the use of stimulants and energy drinks. Avoid caffeine and, if necessary, consume it only in the morning.
- Eliminate psycho-emotional stress through the use of autogenic training and music that is pleasant to listen to, as well as walking before going to bed.
- During sleep, the room should have an optimal air temperature (18–22°C), a calm atmosphere and the absence of light, especially blue.
- Never smoke cigarettes or use nicotine.
- Just before bedtime, if possible, try to avoid or limit high-intensity physical activity, which can increase cortisol levels, which impair sleep.
- Eating carbohydrates (high glycemic index foods) and foods high in protein before bed can improve sleep, while high fat intake can disturb it.

- If possible, try not to drink liquids before bed.
- Do not fall asleep with the TV on.

Conclusion. The duration of night sleep favorably affects the PP of young men involved in sports, which is determined by a number of cumulative factors, one of the most important is the physiologically determined process of restoring the activity of functional systems in a state of relatively long-term functional rest. The longer the night's sleep, the higher the PP level. For students involved in sports, the duration of night sleep should not be less than 5 hours, because this adversely affects the functional state of the athlete. The maximum oxygen consumption is determined by the high sports qualification of young men and serves as a marker of the functional state. It should be taken into account that the higher the qualification of an athlete, the more resistant his body to lack of sleep, which does not affect the PP. At the same time, we consider it premature to make a long-term forecast on the possibility of maintaining a high level of PP with a lack of night sleep, and we plan to conduct a dynamic study.

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皮肤老化
SKIN AGING

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注释。衰老是每个人生活中不可或缺的一部分。所有器官和系统都会经历一个老年变化阶段，皮肤是与年龄相关的变化最明显的器官。人口的总寿命在增长，但到了50岁的时候，皮肤的结构变化已经是不可避免的，首先影响到表皮，真皮，皮下脂肪也受到影响，衰老的特征就会显现出来。本文讨论了。

关键词：表皮、真皮、老年学变化、衰老。

Annotation. Aging is an integral part of every person's life. All organs and systems go through a stage of gerontological changes, the skin is the organ whose age-related changes are most noticeable. The total life expectancy of the population is growing, but when reaching the age of 50 years, structural changes in the skin are already inevitable, first of all they affect the epidermis, the dermis, subcutaneous fat also suffers, the features of aging will be discussed in this article.

Keywords: epidermis, dermis, gerontological changes, aging.

Introduction

Age-related skin changes and methods for their correction are an important problem of modern dermatology and cosmetology. Skin is a complex multilayer organ consisting of ectoderm and mesoderm [1]. The ectoderm gives rise to the epithelium - the outer layer, as well as the nervous system. The mesoderm forms the deep layers of the skin, where the vessels, glands and hair follicles are located. It was this complex structure that prevented scientists from recreating the skin as an organ of the human body [2]. Cellular aging is what determines the chronological aging of the skin, that is, metabolic activity decreases, the recovery processes no longer allow the skin to return to its original state [3].

Main part

Over time, the processes of skin changes only get worse, outwardly they are characterized by a decrease in elasticity, dryness and flabbiness, the appearance of first small mimic, and then deep wrinkles [4]. The skin becomes much thinner and can no longer adequately respond to damage associated with external factors,

reparative processes are significantly reduced. It is easy to injure aging skin; first of all, it is characterized by high sensitivity to sunlight [5]. Aging begins in fibroblasts; this process is stimulated by involuntional changes [6].

In close relationship are such processes as collagen synthesis and a decrease in the level of fibroblast activity, which ultimately leads to a decrease in the amount of estrogen, if not stopped, then this process can be slowed down using hormone replacement therapy [7]. About 40 days is the rate of renewal of the epidermis in people who have reached old age, and this causes hyperkeratosis, atrophic changes in the dermis and depletion of its layer.

The thickness of the epidermis of young people is about 35-50 microns, as they age, this figure decreases to 25-40 layers, while the layers of the skin themselves, namely the epidermis, dermis, subcutaneous fatty tissue, remain in place regardless of age. Skin hydration decreases with age, the number of active melanocytes decreases by 10-20% approximately every 10 years, which can be used to explain the increase in skin sensitivity to ultraviolet solar radiation among the elderly [8]. Those melanocytes that remain may be enlarged and their distribution becomes uneven, which explains the presence of a large number of age spots on the skin of older people [9]. Chronoaging leads to a decrease in the thickness of the skin, that is, on average, the thickness of the skin of an elderly person is 20% less than that of young people, however, on the contrary, its stratum corneum may increase, which leads to the appearance of hyperkeratosis zones [10].

Anatomically, the layers of the skin look like this: the epidermis is located on the basement membrane, followed by the papilla layer of the dermis, which consists of fibrils of different diameters, multidirectional [7]. The fiber diameter of 20–60 nm is typical for those that come close to the basement membrane, the thinner ones, 10–20 nm, are located lower, the thickness of the lowest fibers is 8–12 nm [10].

The basal layer of the epidermis and the upper layer of the dermis contain melanocytes, pigment cells containing melanin, a black or dark brown pigment that determines skin color [11]. Melanocytes have long branching processes that pass through the intercellular spaces of the spinous layer and go outward to the granular layer. The cytoplasm of melanocytes contains many ribosomes and melanosomes [12].

Melanosomes are oval-shaped structures consisting of dense pigment granules and a fibrillar framework surrounded by a common membrane. They are packed by the Golgi apparatus into secretory granules [13]. The granules are round in shape (in red-haired people, the granules are oval) [14]. Under the action of UV rays, melanocytes synthesize melanin and mature melanosomes [15]. Melanosomes are transported to keratinocytes. Keratinocytes filled with melanin cause darkening of the skin (sunburn). Sunburn is an adaptation of the body to increased UV radiation [4].

The value of melanocytes: protect from UV rays (sunburn); determine the color of the skin, eyes, hair. Langerhans cells are cells of the immune defense of the germ layer of the skin. They have a tree shape. Formed in the bone marrow. They are able to migrate from the epidermis to the dermis and regional lymph nodes and thus form an immune response [16].

The function of Langerhans cells [17]: immune defense: phagocytosis and transport of antigens to the nearest lymph nodes, development of an immune response (including allergic) and immune memory; antiviral and anticancer protection; endocrine function: synthesis of biologically active substances - interferons, interleukins, etc. The number of Langerhans cells decreases with aging, UV radiation, intoxication and chronic diseases [10]. Merkel cells (tactile or tactile cells) are located in the basal layer of the epidermis and in the epithelium of hair follicles [13]. These cells are involved in the formation of skin sensitivity. A large number of these cells are found in the epithelium of the fingertips [18].

Gerontological changes in the epidermis begin with such a process as the accumulation of keratinocytes in the stratum corneum, since by the age of 40 keratinocytes are renewed more slowly, which leads to a decrease in the thickness of the epidermis, slowing down the processes of cell metabolism, every decade the level of melanocytes becomes less by 10-20%. expression lines and both fine and deep wrinkles become visible [15].

In women, upon the onset of menopause, the level of estrogen decreases markedly, the epidermis becomes heterogeneous, the dermis becomes noticeably thinner, and the subcutaneous fat layer atrophies [19]. The elasticity of the skin is reduced and the ability to self-renewal is lost, as is the ability to vascularize both the hypodermis and the dermis. The superficial dermis gradually smoothes and atrophies, the collagen framework is disturbed, elastin fibers go through the process of degeneration and progressive disappearance, and the interstitial mucoid space increases in volume [6].

Over time, signs of a degenerative-dystrophic process develop, colloidal masses accumulate in the dermis, which changes the skin, giving it a yellowish tint [8]. Progressive ptosis is formed, since the effect on the skin is double, not only degenerative changes, but also gravity involves not only skin structures, but also the fatty, facial part of the subcutaneous cervical muscle in the process of ptosis [20].

After reaching the age mark of 40 years, scientists note that each subsequent decade, a decrease in basal metabolism is recorded by about 5%, which in turn stimulates fat accumulation in such areas of the body as: hips, abdomen, waist [7]. On the face, there is also an accumulation of fat, but to a lesser extent, for example, the chin, cheeks, and the area around the eyes. This is due to the fact that there are fascia septa on the face, the function of which is to maintain facial fat, which over the years no longer fulfill their function in full, weaken.

The level of subcutaneous fat becomes less, while the deep zones under the fascia, on the contrary, are filled. Menopause is primarily a hormonal restructuring of the body, which leads to a decrease in the secretory function of the glandular tissue of the face, in some cases to its complete atrophy [17]. The skin loses its elasticity and density, becomes saggy and aesthetically unattractive. Gradually reduces the elasticity of the surface skin layer, as it loses moisture - it becomes dehydrated, its thickness decreases [3].

The amount of subcutaneous fat decreases, which significantly aggravates degenerative-dystrophic changes in the skin, muscle hypotension and fatty hypotrophy occur [18]. Senile skin atrophy usually develops more often in women aged 60–70 years in places exposed to solar insolation: the face, the lateral surface of the neck, the V-region of the neck and chest, and the back. The skin becomes atrophic, elasticity is lost, peeling, wrinkles, yellow tint appear - “Milian’s lemon skin” [6].

The thickness of the skin is influenced by the ethnicity of a person, and therefore the characteristics of aging, depending on the ethnic group, will also have a number of differences [21]. For example, dark-colored skin (representatives of the Negroid race) has a large amount of melanin in its composition, which is contained in the deep layers of the epidermis, which means that it is much better protected from insolation than fair skin. A greater phenotypic severity of solar elastosis is characteristic of people with fair skin and it occurs earlier, especially in those who have red hair, since this phenotype of people has the fairest skin [22]. Individuals with this phenotype should be especially vigilant about the duration of sun exposure given the increased risk of sunburn and especially basal cell, spinocellular carcinoma of the skin and melanoma.

The appearance of such parts of the body as the neck and face undergo both morphological and external changes with aging [23]. Among the main diagnoses used to describe the clinical picture of aging of the face and skin, according to the clinical criteria and definitions of the International Classification of Diseases of the 10th revision (ICD-10) - the section “Diseases of the skin and subcutaneous tissue”, there are two nosologies associated with age-related skin changes: chron-oaging - “senile atrophy of the skin” (L 57.4) and photoaging - “skin changes caused by chronic exposure to non-ionizing radiation” (L 57) [24].

The connective tissue of such a layer of the skin as the dermis has a heterogeneous characteristic; it is characterized by blurred fuzzy boundaries [15]. The papillary layer has a looser structure, which gradually becomes a connective tissue, which is denser in structure, as it is characteristic of the reticular layer, in which the fibrous component predominates. The next layer is subcutaneous adipose connective tissue [18].

The dermis consists of several structural parts, collagen is one of the main ones. It is collagen that makes the skin supple and elastic [25]. Collagen is not

one substance, there are more than 20 types of it, genetic varieties [3]. Thin collagen fibers are characteristic of the skin of an adult, they are formed from several fibers, that is, such a fiber is represented by types III and I, when the latter braid the former, ensuring their spatial orientation. After the skin has been damaged and the repair process has begun, type III begins to predominate in postnatal and fetal skin, and its amount decreases as it heals. When wound healing is at a later level, another collagen, type I collagen, is synthesized, its greatest amount can be found in scar tissue [26].

The diameter of fibrils is also regulated by collagen, only type V, while it must be combined with the first and third types, it can also be found in the walls of blood vessels, which ensures their elasticity and flexibility, it is important in the process of formation of basement membranes [5]. The entire dermis is permeated with type VI collagen, scientists suggest that it takes part in the organization of the interstitial dermal substance and is associated with fibrils. In the appendages of the skin, in the composition of blood vessels and in the basement membrane, type IV collagen can be found.

Type VII collagen forms anchor fibrils in the dermoepidermal lamina and is associated with fibrils in the papillary dermis [27]. Collagen types I, II, III and V are fibrillar, because able to form filaments and fibrils. When characterizing other types of collagen, they can be called amorphous, since they do not have this kind of ability [4]. Collagen fibers are in a constant state of renewal. Fibroblasts destroy fibers, including at the physiological norm, this is necessary to provide the organism with the necessary set of farmers for fibroclasia. Fibers can undergo cleavage both outside and within cells, an intracellular cleavage process called collagenolysis.

In the dermis there is a thin but extensive network, which is formed by elastic fibers, the amount of elastin is about 90%. Elastin, like collagen, contains a large amount of proline and glycine, in addition, it is characterized by the presence of two unique amino acids: desmosine and isodesmosine [20]. Since the elastic fibers of the oxytalan type are among the thinnest, their location is under the epidermis, perpendicular to the skin [28]. With age, these fibers are destroyed, which leads to such external manifestations as sagging of the skin and its lethargy, eventually wrinkles form on the spot from the destruction.

The proteoglycan component, which is characteristic of the matrix, is responsible for such processes as compressive strength, hydration, deformation in all its manifestations: the ability to overcome it, the ability to overcome it, the ability to recover by hydration, thus elasticity returns to the skin [29]. Due to the catabolism of glycosaminoglycans, a successful exchange of the main substance is carried out, with aging, the number of protein intermolecular bonds only increases, which leads to the formation of a large amount of collagen, which is resistant to the action of enzymes.

Gerontological skin changes are an inevitable process that can be slowed down by cosmetic procedures, but not completely stopped. However, there are several key reasons for such changes [8]. First of all, age-related changes in the skin are associated with irreversible genetic processes that are programmed in the DNA code [18]. This process is called natural aging or chronoaging [13]. The essence of the changes lies in the fact that the stratum corneum of the skin becomes thicker, while the rest of the words become much thinner. The amount of hyaluronic acid produced in the skin becomes smaller, the walls of blood vessels become thinner, the skin loses its elasticity, and wrinkles form [14].

Another reason for gerontological changes in the skin is that the body wears out due to various diseases, stress, and other negative health effects. Changes can be both internal and external; internal causes include.

Internal aging of the skin leads to histological changes in each layer, including flattening of the border located between the epidermis and dermis, the papillary dermis layer disappears, the number of Langerhans cells and melanocytes decreases, atrophy of the dermis gradually increases and the number of fibroblasts decreases, elastic fibers in the dermis atrophy.

Bad habits also negatively affect the condition of the skin, especially such exogenous factors as [25]: UV radiation, sun, frost, wind. When exposed to them, the skin becomes rough and thinner, scientists believe that gerontological aging of the skin is influenced not so much by aging as by exposure to ultraviolet rays. First of all, those areas of the skin that are not protected by clothing are subject to changes. Aging with external exposure to the skin is characterized by such histological changes as: elastosis, hyperproduction of abnormal elastic fibers, an increase in the number of mast cells, histiocytes and fibroblasts [15].

The dermis of the skin is a very important component, since it determines the morphological and functional properties of the skin. Many theoretical data and aspects of the biomechanics of aging remain unexplored [17]. Nevertheless, new data are constantly emerging on the influence of genetic factors, stem cells, telomeres, the immune system and hormones on the aging process, which in the future should lead to the introduction of new methods to combat this phenomenon [3].

Gerontological changes in the skin also affect the quality of human life. The world in which a modern person lives is impetuous and strives for perfection, life expectancy has increased, which means that keeping the skin in good condition allows him to occupy a more comfortable niche in society, so even when choosing an employee (the age of employees will be equal), preference will be more likely everything is given to the one who looks better, since appearance is often a priority [11].

People strive to keep their skin young and healthy, using various cosmetic products and plastic surgery interventions for this. Nowadays, at 50, life is just be-

gining, but having deep wrinkles and skin with pronounced age-related changes, it is difficult to enjoy life, realize your desires both personally and professionally, so the connection between the skin condition and the quality of human life is obvious. , they are closely related to each other [9].

Conclusion. The skin is exposed not only to the negative impact of exogenous negative processes, but also to various internal, structural changes.

Today, the importance of further study of the substrate of age-related changes in the skin - its structure is obvious. However, information on age-related changes in the skin still remains fragmentary and limited in relation to specific quantitative characteristics.

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29. *AGE-ASSOCIATED CHANGES TO FACE SKIN IN THE CONTEXT OF CHANGE OF ITS MORPHOLOGICAL STRUCTURES (REVIEW)*

Osipova O.A., Mezentsev Y.A., Shabalin A.R., Krupenkina L.A., Hoshenko Y.A. *International Journal of Pharmaceutical Research. 2020. T. 12. № 2. C. 1619-1622*

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混合焦虑和抑郁症患者的实验室和临床相关性
**LABORATORIAL AND CLINICAL CORRELATIONS IN PATIENTS
WITH MIXED ANXIETY AND DEPRESSIVE DISORDER**

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抽象的。该研究的目的是评估混合焦虑和抑郁症患者的实验室和临床参数的变化。因此，我们确定了混合焦虑和抑郁症患者的免疫和代谢状态的变化。我们还揭示了所有研究参与者的焦虑和抑郁与免疫和代谢状态之间的统计显著相关性。

关键词：焦虑、抑郁、新陈代谢、免疫、情感障碍。

Abstract. *The objective of the study was to evaluate changes of laboratorial and clinical parameters in patients with mixed anxiety and depressive disorder. Thus, we established a change of immune and metabolic statuses in patients with mixed anxiety and depressive disorder. We also exposed statistically significant correlations between anxiety and depression and immune and metabolic statuses of all study participants.*

Keywords: *anxiety, depression, metabolism, immunity, affective disorders.*

According to scientific data, anxiety and depression are the most common mental disorders all over the world, almost 20% of people population suffer from symptoms of anxiety and depression [9, 10]. Mixed anxiety and depressive disorder (F41.2, ICD-10) is characterized by symptoms of both these disorders: anxiety, worry, fatigue, low mood, distractable attention, sleep disturbances, crying, acrimony, somatic symptoms etc. Over the last years a hypothesis of immune-metabolic regulation of central nervous system was developed [1, 5, 6, 7]. Both

of systems (immune and central nervous) are spread over the whole body, have the property of “memorizing” and are operated dominantly by common receptors and mediators [2]. By the way, there is some evidence that products of free-radical lipid oxidation (FRO) can damage cells’ biomembranes and cause an immunosuppression [3, 4, 11, 12, 13]. Our experiment is dedicated to study clinical and laboratorial aspects of mixed anxiety and depressive disorder to modify a course of disease. **Aim of the study** is to evaluate a dynamic in clinical and laboratory parameters in patients with mixed anxiety and depressive disorder (MADD), what can help to choose further immunocorrecting therapy. **Design and methods.** This study was retrospective and individually randomized. All participants gave written informed consent. We recruited 96 patients, 20 – 52 age, from day patient facility of Voronezh Regional Clinical Psychoneurological Dispensary, that had a diagnosis of mixed anxiety and depressive disorder (MADD) and no cardiovascular, respiratory, urinary, endocrine or oncological somatic anamnesis. As a control group we recruited 30 participants with no any psychiatric or somatic pathology. All participants were asked to full in a Hospital Anxiety and Depression Scale (HADS), an anamnesis and complaints were measured. We also measured blood samples (20 ml) at the Screening Visit for laboratorial study. As a psychopathological symptom (PS) we evaluated sense of inner tension, sense of alarm, inquietudes and distractable attention, anxiety and worry, low mood, crying, the reduction of the energy potential, asthenia, low self-esteem, pessimism, sleep disorder, aggression, memory disturbances, somatic symptoms, feeling “lump in a throat” (as the most quoted symptoms). We estimated immune and metabolic statuses (levels of T-cells, T-helpers, T-cellulotoxic suppressors, natural killers; B-cells, IgA, IgM, IgG, circulating immune complexes, medium mass molecules, phagocytic index, phagocytic number, nitrobulletetrazolium tests, IL-4, -6, -8, TNF- α , malondialdehyde, diene conjugates, Schiff’s bases, bityrosine crosslinks, antioxidative blood plasma activity, vitamin E, superoxide dismutase, ceruleoplasmin, catalase). Results were consolidated and data-processed by parametric and non-parametric methods (Student’s criteria and Mann-Whitney test [4, 8]. Correlative analysis was executed by Spearman method [4] with definition of intrasystemic (between immunological and metabolic parameters), intersystemic (between immune-metabolic parameters and psychiatric symptoms) and extrasystemic correlations (between laboratory parameters and clinical symptoms) [8]. Index of correlation $> 0,6$ was in statistical control.

Results and discussion. Received results are summarized in Tables 1, 2.

Table 1.

Intensity of psychopathological symptoms in patients (in %).

1. Anxiety and worry	100
2. The reduction of the energy potential	90
3. Low mood	95
4. Inquietudes and distractable attention	80
5. Sleep disorder	100
6. Crying	100
7. Aggression	50
8. Low-self esteem	70
9. Feeling "lump in a throat"	85
10. Sense of alarm	70
11. Pessimism	90
12. Somatic symptoms	100
13. Sense of inner tension	70
14. Asthenia	85
15. Memory disturbances	95

Table 2.

Laboratory changes in patients with MADD

Identified differences in parameters			
Immunological		Metabolic	
T-cells	-	Malondialdehyde (MDA)	+
T-helpres (T-h)	-	Diene conjugates (DC)	+
T-supressors (T-s)	-	Shiff's bases (SB)	+
Natural killers (NK)		Bityrosine crosslinks (BC)	+
B-cells		Antioxidative blood plasma activity (ABA)	-
IgG	+	Vitamin E (VE)	-
IgA	+	Superoxide dismutase (SOD)	-
IgM	+	Ceruleoplasmine (CP)	-
Circulating immune complexes (CIC)	+	Catalase (C)	-
Medium mass molecules (MMM)	+		
Phagocytic index (PI)	-		
Phagocytic number (PN)			
Spontaneous NT-test	-		
Activated NT-test	-		
IL-4	-		
IL-6	+		
Il-10	-		
TNF- α	+		

Designation: (-) – no differences, (+) – differences are identified.

As follows from the Tables 1, 2, patients with MADD have a decreased level of T-cells, T-helpers, T-suppressors, increased levels of IgG, circulated immune complexes and medium mass molecules. We also detected a decreased level of phagocytic index and number, anti-inflammatory interleukins (IL-4, -10) and increased level of pro-inflammatory interleukins (IL-6, TNF- α). A free-radical lipid oxidation was stimulated (increase of malondialdehyde, diene conjugates, Schiff's bases, bityrosine crosslinks) in comparison with antioxidative blood plasma activity (suppression of levels of vitamin E, superoxide dismutase, ceruloplasmin).

A further analysis revealed that laboratorial immune-metabolic parameters in patients with MADD made statistically significant correlations between themselves and clinical psychopathological symptoms. Thus, there were 29 intrasystemic significant correlations (immune-immunological and immune-metabolic), 18 intersystemic significant correlations (immune-metabolic) and 29 extrasystemic significant correlations (immune-metabolic-clinical).

Various clinical psychopathological symptoms among patients with MADD (low mood, low self-esteem, aggression, feeling "lump in a throat", sense of inner tension) were significantly correlated with 9 immunological parameters (T-suppressors, natural killers, IgG, circulating immune complexes, phagocytic number, spontaneous NT-test, IL-4, -6) and 3 metabolic parameters (Schiff's bases, vitamin E, catalase). We conceive a mathematically significant association of laboratorial and clinical parameters to be fundamental significant.

We also find that T-parameters (cells-parameters) were significantly correlated with phagocytic and cytokine components of immune system, free-radical lipid oxidative and antioxidative blood plasma activity' systems. B-cells' tests were matched with B- and phagocytic component of immune system, free-radical lipid oxidative and antioxidative blood plasma activity' systems and psychopathological symptoms of anxiety and depression. Phagocytic neutrophiles' activity was associated with cellular, humoral, cytokine, metabolic-antioxidative reactions clinical symptoms of anxiety and depression. Cytokine component of immune system had an impact on T-, B- and phagocytic components of immune system, free-radical lipid oxidative and antioxidative blood plasma activity' systems and psychopathological symptoms of anxiety and depression. It is noteworthy that in all cases metabolic-antioxidative factors correlated with clinical symptoms of MADD (with different variations).

In terms of the clinical development, it was found that such symptoms as low mood, feeling "lump in a throat", aggression, low self-esteem and sense of inner tension were most pronounced in comparison with other symptoms of MADD. Moreover, metabolic status (in compare with immune status) has been the most affected, which indicates a possible prevalence of metabolism's change by contrast to immune status in patients with MADD. Received data can be a reason to

introduce it in antidepressive and anxiolytic drug therapy. It also seems important to correct metabolic changes using an immunocorrecting therapy. Nevertheless, antidepressants and anxiolytic drugs should be considered as a first-line treatment in patients with anxiety and depression.

Conclusion. Thereby, psychopathological symptoms in patients with mixed anxiety and depressive disorder were accompanied by changes of immune and metabolic statuses. Furthermore, laboratorial varieties were associated with various clinical psychopathological symptoms. Apparently, changes in clinical psychopathological, immune and metabolic statuses are conforming components of common pathogenetic mechanism in patients with anxiety and depression.

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多学科医院条件下医疗机构的营销管理
**MARKETING MANAGEMENT IN THE HEALTH CARE
ORGANIZATION IN CONDITIONS OF A MULTIDISCIPLINARY
HOSPITAL**

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抽象的。 本文介绍了为改善多领域医院的营销管理而开发和提议的组织活动，以及利用现代营销信息（分析、互联网和公关技术）组织和向人们提供可获得的高质量医疗服务的作用。

关键词：多领域医院、医疗服务、营销管理。

Abstract. *The paper presents developed and proposed organizational activities to improve the marketing management of a multifield hospital and its role in organizing and providing the population with accessible and high-quality medical services using modern marketing information - analytical, Internet and PR technologies.*

Keywords: *multifield hospital, medical services, marketing management.*

In recent years, in the healthcare system of the Republic of Kazakhstan, there have been trends towards a dynamic and rapid development of the development of new and the introduction of improved medical technologies and methods. These areas were especially concerned with the provision of specialized, including high-tech medical care to the population in large clinics [1], one of which is the Hospital of the Medical Center of the Administration of the President of the Republic of Kazakhstan, which is considered a large multidisciplinary clinic not only in our country, but throughout the Central Asia.

Taking into account the current real situation in the field of healthcare, it should be noted the need to develop and implement objective criteria and indicators for assessing the medical and technological fullness and the final results expected by patients in the organization of medical services [2]. These measures as a whole should provide a significant breakthrough in increasing the volume, expanding the range and improving the quality of services provided, for this serious management

projects should be developed and implemented to expand their range. As a result, medical organizations providing all types of medical care to the population are equipped with modern equipment and apparatus, which has significantly expanded the list and increased the accessibility of the country's population to diagnostic, therapeutic, and medical and rehabilitation services [3].

In modern conditions, the health care system is a field of activity, the main tasks of which include maintaining and improving the level of public health, providing affordable medical care [4]. At the same time, these measures are aimed at improving the quality of medical care, which is constantly filled with reliable and high-quality medical services [5,6]. Within the framework of the foregoing, it should be noted that the organization of the medical care service should be constantly studying the rapidly changing demand of the population and promptly responding to its change by organizing new competitive medical and diagnostic services [7]. At the same time, it seems that the most important reasons should be sought in the market attractiveness of the medical services provided, their innovative content and quality [8,9].

In the implementation of this task, the modernization of the marketing activities of medical organizations is of paramount importance. Unfortunately, it should be noted that the previously used arsenal of marketing tools was most often ineffective and was not always limited to systemic, but expensive advertising activities. Meanwhile, the main goal of the marketing activities of clinics is an in-depth study of the ever-changing demand of the population in the market of both public and private medical services and the provision of competitive and high-quality offers aimed at meeting the ever-increasing needs of the population [10,11].

Achieving this goal is possible under the condition of an integrated, systematic approach to the use of modern information and analytical technologies and the availability of highly qualified marketing specialists.

Based on the foregoing, we consider it appropriate that the marketing service of hospital organizations should be staffed by trained specialized specialists in marketing medical services using modern Internet and PR technologies.

At the same time, organizational conditions must be created for:

1. Development and implementation of a strategy that regulates the demand for the services of multidisciplinary hospitals, providing for:

- research, analysis, assessment and forecasting of the state of real and potential markets for public and private medical services with the definition of the main trends of its current, medium-term and long-term forecasting and development; real and potential consumers (individuals and legal entities):

- a comprehensive analysis of the volume and quality of medical diagnostic and rehabilitation services provided in hospital organizations;

- study and assessment of the competitiveness of market participants in public and private medical services;

- setting up marketing communications using active events (round tables, presentations, seminars, videoconferences);
- maximizing the sale of medical services among consumers (modern PR technologies).

2. Development and implementation of a strategy that generates proposals that include:

- a detailed study of the institutional capabilities of hospital organizations to provide the market with high-quality and competitive types of medical and diagnostic care;
- analysis, assessment and development of the competitiveness of services provided by medical institutions (quality and list of medical and diagnostic services in demand on the market, completeness of the use of existing equipment and apparatus, level of service);
- active participation in the development, implementation and use of new innovative types of medical services.

At the same time, the costs of marketing activities are fully justified, since the competitiveness of hospital organizations is supported by constant innovative updating of the services provided and the service provided.

In our opinion, the principles of innovative activities of clinics should be based on the conceptual foundations of their development, the formation and implementation of targeted programs to improve the key elements of organizational and medical and technological work.

When analyzing the prices set in the current price list, there are often doubts that they are formed on the basis of a differentiated accounting for actual costs, the level of profitability and their market attractiveness. In this regard, it seems necessary to review them annually, taking into account inflationary risks and changes in their demand, the volume and structure of labor and medical and technological costs, understanding that the level of prices for paid hospital services is in itself a powerful self-regulator of their competitiveness and demand.

It is also important to develop and implement a flexible system of discounts and preferences for various social groups of the population in the provision of similar content, but differing in technological complexity, labor intensity and paid medical services.

Separately, it should be noted the need to develop and implement objective criteria and indicators for assessing the medical and technological fullness and the end results expected by patients when organizing paid medical and diagnostic services.

In order to achieve a stable and increased profitability of multidisciplinary hospital organizations and the introduction of modern approaches to planning and using income, it is necessary to:

- 1) expanding the types and volumes of paid medical services provided to legal entities and individuals;
- 2) optimization of costs, cost reduction and increase in the competitiveness of the services provided by hospitals;
- 3) expansion of the list of medical services provided and the use of acceptable profitability rates that correspond to market and competitive offers;
- 4) strengthening control over the volume of medical and diagnostic services provided;
- 6) creation of a competitive environment in the market of public and private medical services;
- 8) reforming wage systems (development and implementation of a methodology for calculating the wages of hospital workers depending on the volume and quality of medical care provided);

As part of the implementation of this program will:

- the volume and range of medical services provided to the population have been increased;
- improved the quality of medical and diagnostic care provided to the population;
- improvement of the current system of accounting and expenditure of financial resources;

Thus, the developed and proposed organizational measures to improve the marketing management of a multidisciplinary hospital and its role in organizing and providing the population with affordable and high-quality medical services based on the use of modern marketing information-analytical, Internet and PR technologies in general should provide a significant breakthrough in increasing volume, range and significant improvement in the quality of medical services provided to the population.

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表观遗传母体因素在子宫肌瘤形成中的作用

THE ROLE OF EPIGENETIC MATERNAL FACTORS IN UTERINE MYOMA FORMATION

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引言和假设

子宫肌瘤是最常见的生殖系统肿瘤之一，其发病机制仍知之甚少。目前正在积极研究风险因素。这项研究的重点是与子宫肌瘤相关的母亲表观遗传危险因素。

方法

该研究对患有子宫肌瘤的育龄女性患者 (n = 915) 填写的问卷进行了回顾性审核，这些患者有可能向母亲询问其社会地位和生活方式的特殊性以及怀孕和分娩的过程。作者制定的调查问卷包括 4 个部分和 32 个问题。使用逻辑回归模型分析具有统计显著性的变量。

结果

该研究确定了显著影响后代子宫肌瘤发病率的母亲表观遗传危险因素。这些因素包括：母亲的分娩年龄低于 25 岁、有兄弟姐妹、是家里的第一个孩子、缺乏高等教育、怀孕期间从事繁重的体力劳动或活动量较低的久坐工作以及妊娠中毒。怀孕期间的压力和服用维生素等因素与后代患子宫肌瘤的风险较低有关。

结论

居住在农村地区的妇女似乎需要特别关注，她们更频繁地从事繁重的体力劳

动，并且对怀孕期间的营养支持有一定的食物选择和一定的看法。结果表明，如果孕妇存在与子宫肌瘤相关的表观遗传风险因素，则需要医护人员对孕妇进行教育，并加强对妇女一生的控制和筛查。

关键词：子宫肌瘤，孕产妇危险因素，表观遗传因素。

Introduction and hypothesis

Uterine fibroids are among the most common reproductive system tumors whose pathogenesis is still poorly understood. The risk factors are currently being actively studied. This study focused on maternal epigenetic risk factors associated with uterine fibroids.

Methods

The study is a retrospective audit of questionnaires completed by female patients (n = 915) of childbearing age with uterine fibroids who had the possibility of asking their mothers about the specificities of their social status and lifestyle as well as the course of pregnancy and delivery. The author-developed questionnaire included 4 sections and 32 questions. Statistically significant variables were analyzed using a logistic regression model.

Results

The study identified the maternal epigenetic risk factors significantly affecting the incidence of uterine fibroids in the progeny. These include: mother's age at delivery under 25 years, having siblings, being the first child in the family, lack of higher education, heavy manual work during pregnancy or sedentary work with a low level of activity, and pregnancy toxicosis. Such factors as stress during pregnancy and taking vitamins are associated with a low risk of uterine fibroids in the progeny.

Conclusion

Women residing in rural areas, who more frequently perform heavy manual work and have certain food choices and certain views regarding nutritional support during pregnancy, seem to require special attention. The results suggest the need for educating pregnant women by healthcare personnel and enhancement of control and screening of women throughout their lifetime if they have maternal epigenetic risk factors associated with uterine fibroids.

Keywords: *uterine fibroids, maternal risk factors, epigenetic factors.*

Introduction

Uterine fibroids are the most common benign gynecologic tumors. The incidence of uterine fibroids ranges from 25% to 80%, depending on the population as well as multiple risk factors [1].

The formation of fibroids is known to be associated with multiple factors, including race, high body mass index, burdened family history, being nonparous, time of menarche and menopause [2]. Genetics and hereditary background are

also essential for pathogenesis, suggesting that some women are more prone to the formation of fibroids than others. This fact is supported by cases of so-called “familial fibroids” [3].

Several new publications have defined the mechanisms by which maternal nutrition and environmental effects such as stress and toxic substances modifying the expression of imprinted genes during pregnancy can affect the fetal and neonatal phenotype and the child’s susceptibility to the disease later in life [4].

This preparation is achieved by changing the fetal epigenome and is called “fetal programming,” or the Barker hypothesis [5]. Thus, such developmental programs can be both helpful and harmful depending on the prenatal and postnatal conditions [6].

The data accumulated over the past three decades support the developmental origins of health and disease (DOHaD) theory that implies fetal phenotype programming without altering the genotype as such. These hereditary modifications of gene expression occur through DNA methylation, histone modification, and non-coding RNA-associated gene activation or gene silencing, all of which are defined as epigenetic modifications [7].

This study focused on the identification of important clinical epigenetic maternal risk factors associated with uterine fibroids.

Methods

Study design and participants

The study is a retrospective audit of questionnaires completed by female patients of childbearing age (18 to 49 years) with uterine fibroids who had the possibility of asking their mothers about the specificities of their social status and lifestyle as well as the course of pregnancy and delivery. A total of 915 women were enrolled in the study. The case group consisted of 518 women with uterine fibroids of various locations and sizes. The control group included 397 women without uterine fibroids who came for a routine postpartum checkup or contraceptive counseling.

Uterine fibroids were diagnosed based on the findings of pelvic ultrasound. A transvaginal transducer on a Voluson E 10 Expert ultrasound system was used.

All the study subjects signed the informed consent.

Data collection

The study consisted of a patient questionnaire survey (including telephone interviews) and statistical data analysis. An author-developed combined questionnaire with 4 sections and 32 questions was used in the study.

The first section covered sociodemographic characteristics of probands’ parents: the father’s and the mother’s age at conception, area of residence, social status and education of the mother, the family size and the number of children, hereditary features of the reproductive system, and occupational hazards. A range

of questions regarding the mother's medical conditions was also included in this section. The mother's education level (during pregnancy and delivery) was classified as follows: 1) college student; 2) college graduate; 3) without a college degree (secondary education). Proband's mothers gave a subjective assessment of their lifestyle and the severity of stressful situations during pregnancy. Stressful situations were taken into account if they were related to a disease or death of close relatives during pregnancy, financial problems, or work and family stress. Heavy manual work was defined as any work that involves heavy lifting, inconvenient working hours (outside of the time from 6:45 a.m. till 5:45 p.m.), long working hours (more than 35 working hours per week), less than 2 days off per week, and working after week 32 of pregnancy (similar to reproductive risk factors) [8,9]. If at least one of these factors was present, the work was classified as "heavy."

The second section addressed the course of pregnancy and labor in proband's mothers: the weight gain during pregnancy, manifestations of preeclampsia (nausea, vomiting, edema, etc.), type of delivery, and complications.

In the third section, medications taken by proband's mothers during pregnancy were recorded, with a special focus on hormone and vitamin therapy.

The fourth section included dietary preferences of proband's mothers during pregnancy and compared a high-carbohydrate diet with a protein-based diet.

Statistical analysis

Data entry was carried out and the Statistical Package for Social Sciences (SPSS) v10.0.7 was used for the data analyses. Descriptive statistics, depicted as counts (percentages), were used to summarize the demographic characteristics, obstetric history and comorbidity of the participants. Variables identified as being significant ($p < 0.05$) in these initial tests were then entered into a logistic regression model to determine the risk factors for uterine fibroids.

To compare dichotomous variables in independent samples and establish significant differences between them, the chi-square test was used. Intergroup differences were considered statistically significant at $p < 0.05$.

Results

Baseline characteristics

A total of 915 patients were examined and interviewed from February 2017 till October 2020. The mean age of the 915 18-49 year-old participants was $38 \pm 1,2$ years and the most of them lived in urban areas. The majority of the participants had an education background of junior high school and higher (56,17%). More than half of the participants of uterine fibroid group had сопутствующие gynaecological disease (57,4%). The mean BMI of the patients with fibroids was $23,4 \pm 3,2$ kg/m, the group without fibroids - $24,1 \pm 3,5$ kg/m ($p > 0,05$).

Potential maternal risk factors related to uterine fibroids formation

The univariate analysis data suggest that the mother's age at delivery, having siblings, performing heavy manual work during pregnancy, maternal sedentary

lifestyle, pathological weight gain during pregnancy, and symptoms of preeclampsia are reliably associated with uterine fibroids in the interviewed patients ($p < 0.001$) (Table 1).

Table 1

Patient survey findings in both groups (sociodemographic characteristics, the course of pregnancy and delivery, medications, and dietary preferences)

Parameters	UF group (n = 518)	No UF group (n = 397)	p-value	χ^2
Sociodemographic characteristics of the parents				
Mother's age at delivery under 25 years, n (%)	267(51,5)	103(25,9)	<0,001	61,15
Father's age at conception under 25 years, n (%)	95(18,3)	73(18,4)	0,985	0,02
Family history of uterine fibroids, n (%)	355(68,5)	254(64,0)	0,148	2,093
Having siblings, n (%)	422(81,5)	131(32,9)	<0,001	220,82
Being the first child in the family, n (%)	325(62,7)	73(18,4)	<0,001	179,89
Mother's education, n (%):				
-college student,	153 (29,5)	86 (21,6)	0,067	7,221
-college graduate	164 (31,7)	111 (28,0)	0,226	1,464
- without a college degree),	201 (38,8)	200 (50,4)	<0,001	11,820
Residence area:				
-rural, n (%)	282(54,4)	88(22,2)	<0,001	97,19
-urban, n (%)	236(45,6)	309(77,8)	<0,001	97,19
Heavy manual work during pregnancy, n (%)	220 (42,5)	55(13,9)	<0,001	87,55
Sedentary work/inactive lifestyle during pregnancy, n (%)	200(38,6)	44(11,0)	<0,001	87,08
Mother's occupational hazards, n (%)	152(29,3)	14(3,5)	<0,001	100,87
Maternal smoking before/ during pregnancy, n (%)	136(26,3)	77(19,4)	0,054	5,92
Stress during pregnancy (death/ disease of close relatives, divorce), n (%)	89(17,2)	171(43,1)	<0,001	74,07
Contact with animals (cats, dogs, poultry, pigs, cattle) during pregnancy, n (%)	229(44,2)	206(51,9)	0,293	2,316
Maternal cardiovascular diseases, n (%)	56(10,8)	33(8,3)	0,206	1,598

Parameters	UF group (n = 518)	No UF group (n = 397)	p-value	χ^2
Maternal gastrointestinal diseases, n (%)	63(12,2)	38(9,6)	0,2163	1,536
Maternal diabetes mellitus, n (%)	29(5,6)	10(2,5)	0,023	5,223
The course of pregnancy and delivery				
Pathological body weight gain during pregnancy, n (%)	180(34,7)	53(13,4)	<0,001	54,223
ARD during pregnancy, n (%)	54 (10,4)	33(8,3)	0,280	1,166
Nausea during pregnancy, n (%)	267(51,5)	107(27,0)	<0,001	56,24
Vomiting during pregnancy, n (%)	172(33,2)	42(10,6)	<0,001	64,21
Swelling during pregnancy, n (%)	192(37,0)	77(19,4)	<0,001	33,81
Vaginal delivery, n (%):				
-without complications	333(64,3)	237(59,7)	0,085	2,014
-with complications (fetal hypoxia)	82(15,8)	92(23,2)	<0,005	7,870
Operative delivery, n (%):				
-at term, without complications	31(6,0)	19(4,8)	0,429	0,625
- with complications (fetal hypoxia)	72(13,9)	49(12,3)	0,491	0,475
Administration of medicines by probands' mothers during pregnancy				
Hormone therapy during pregnancy, n (%)	19(3,7)	6(1,5)	0,075	3,93
Vitamin therapy during pregnancy, n (%)	57(11,0)	241(60,7)	<0,001	252,8
Other medications during pregnancy, n (%)	46(8,9)	30(7,6)	0,472	0,517
Dietary preferences of probands' mothers during pregnancy				
High-carbohydrate diet (sweets/bakery) during pregnancy, n (%)	226(43,6)	112(28,2)	<0,001	22,93
Protein-based diet during pregnancy, n (%)	170(32,8)	178(44,8)	<0,001	13,77
Show no preference, n (%)	122(23,6)	107(27,0)	0,242	1,38

The variables having a reliable correlation with uterine fibroids in the proband were analyzed using multivariate logistic regression to further identify the relationship. All the variables with a reliable effect in the univariate analysis were used in a logistic regression model (including mother's education at delivery, occupational hazards, area of residence, dietary preferences, etc.). A best-fit regres-

sion model identified 9 major predictors and 2 anti-predictors among the maternal factors significantly affecting the incidence of uterine fibroids in the progeny (Table 2).

Table 2
Multivariate analysis of potential maternal risk factors associated with uterine fibroids ((OR), 95% confidence intervals (CI))

Parameter	UF group (n = 518)	No UF group (n = 397)	B coefficient	OR	95% CI	p-value
Mother's age at delivery under 25 years, n (%)	267(51,5)	103(25,9)	0,73	1,99	(1,65 - 2,39)	0,003
Having siblings, n (%)	422(81,5)	131(32,9)	0,84	2,47	(2,13 - 2,86)	0,029
Being the first child in the family, n (%)	325(62,7)	73(18,4)	1,16	3,41	(2,74 - 4,24)	0,002
Mother's education (college student and without a college degree), n (%)	317 (61,2)	197 (49,6)	1,09	1,61	(1,45 - 1,8)	0,001
Heavy manual work during pregnancy, n (%)	220 (42,5)	55(13,9)	1,19	3,07	(2,35 - 4)	0,014
Sedentary work/inactive lifestyle during pregnancy, n (%)	200(38,6)	44(11,0)	0,97	3,48	(2,58 - 4,7)	0,022
Pathological body weight gain during pregnancy, n (%)	128(24,7)	53(13,4)	0,46	1,85	(1,38 - 2,48)	0,048
Nausea during pregnancy, n (%)	267(51,5)	107(27,0)	0,77	1,91	(1,59 - 2,29)	0,012
Vomiting during pregnancy, n (%)	172(33,2)	42(10,6)	0,43	3,14	(2,3 - 4,28)	0,034
Stress during pregnancy (death/disease of close relatives, divorce), n (%)	89(17,2)	171(43,1)	-0,67	0,40	(0,32 - 0,5)	0,030
Vitamin therapy during pregnancy, n (%)	57(11,0)	241(60,7)	-0,45	0,18	(0,14 - 0,23)	0,002

Discussion The study identified the clinical maternal epigenetic risk factors significantly affecting the incidence of uterine fibroids in the offspring. These include: mother's age at delivery under 25 years, having siblings, being the first child in the family, low level of education, heavy manual work and sedentary work/inactive lifestyle during pregnancy, pathological body weight gain during pregnancy, and preeclampsia. The study also identified 2 factors that are reliably

associated with the absence of uterine fibroids: severe stress during pregnancy and taking vitamins. Literature data analysis did not reveal similar studies to allow for a meaningful comparison of the results. Most studies focus on genetic and epigenetic mechanisms affecting uterine fibroids formation rather than on clinical ones [10].

Our study results suggest that patients with uterine fibroids were significantly more often born to mothers under 25 years of age (51,5 vs. 25,9% in the control group) and were the first children in the family (62,7 vs. 18,4% in the control group); at the same time, the father's age at conception did not differ significantly between the groups. We failed to find similar data in the literature. Most studies focus on various diseases in children associated with late childbearing: bipolar disorders, Alzheimer's disease, autism, hypertension, etc [11]. However, socioeconomic status in childhood is known to be associated with diseases later in life [12]. Certain specificities and disadvantages of the socioeconomic status and lifestyle of mothers under 25 years of age might account for the obtained data.

The analysis of the women's social status during pregnancy and delivery showed that the uterine fibroids group had more college graduates and college students, while no uterine fibroids group mostly included women without a college degree (secondary education). However, the inverse correlation was revealed for cardiovascular diseases by Chen Huang Master et al [13]. Results that differ from our data were also obtained when analyzing the correlation between the mother's level of education and a low birth weight (LBW) infant and health status: the higher the level of education, the lower is the likelihood of LBW associated with the overall health status [14].

Our data suggest that mothers of the patients with uterine fibroids predominantly resided in rural areas (54,4 vs. 22,2% in the no uterine fibroids group) and had occupational hazards (29,3 vs. 3,5% in the no UF group). However, the multivariate analysis did not allow attributing these specificities to maternal risk factors associated with fibroids.

We found that maternal smoking did not significantly affect the incidence of uterine fibroids in the progeny. We failed to find similar data for comparison. There are literature data suggesting that maternal smoking during pregnancy affects the intellectual abilities of the progeny [15], the incidence of neurological diseases in the progeny, and fractures in children under 1 year of age [16], and increases the likelihood of smoking in daughters born to smoking mothers [17].

Such factors as heavy manual work and sedentary work with an inactive lifestyle during pregnancy were significantly more common in mothers of the patients in the case group. According to the data obtained, these factors were reliably associated with uterine fibroids in the offspring. The literature data suggest that moderate physical activity has a protective effect regarding the progeny's susceptibility

to chronic diseases [18]. Based partly on these data, the American College of Obstetricians and Gynecologists (ACOG) recommends moderate physical activity for at least 30 minutes almost every day of the week in uncomplicated pregnancies [19].

Mothers of the patients in the case group more frequently reported toxicosis manifested as nausea (51,5 vs. 27,0% in the control group) and vomiting (33,2 vs. 10,6% in the control group); moreover, swelling and pathological weight gain were almost twice more common in mothers in the case group compared to the control group. Unexpected statistical data were obtained regarding the course of delivery, with complicated delivery (fetal hypoxia during delivery) being nearly twice less common in patients in the case group (15.8 vs. 23.2% in the control group). The rate of operative delivery did not differ significantly between the groups.

The data suggesting that stress during pregnancy reduces the risk of uterine fibroids in the offspring are of special interest. In contrast, accumulating study data show that prenatal exposure to maternal stress increases the risk of behavioral and mental disorders in the progeny during the lifetime; however, there are no data on the effect of maternal stress on the formation of uterine fibroids in the progeny. The effects of maternal stress on the neurological and cognitive development of the progeny, negative affectivity, hot temper, and mental disorders have been shown in numerous epidemiological and case-control studies [20].

The negative impact of stress during pregnancy on children's health was also shown by Tegethoff M. et al [21] who presented data on an increased risk of disorders in almost all organs and systems. Data presented by Franke K. on the effects of maternal stress on fetal neuroanatomy, including their possible mechanisms, are also of interest [22]. In particular, great significance is attributed to cortisol, the most important mediator of maternal stress that is capable of penetrating the placenta. According to the data by various researchers, cortisol induces cell differentiation [23]. Moreover, catecholamines, whose secretion is also increased under stress, reduce intrauterine blood flow during pregnancy, thereby disturbing fetal growth rates and affecting the development of organs and systems [24]. Such negative effects of stress mediators during pregnancy may have some protective effect in the case of uterine fibroids formation; however, these mechanisms require further detailed investigation.

Although both groups had a low rate of hormone and vitamin therapy during pregnancy, our results suggest that the use of vitamins during pregnancy is associated with the absence of uterine fibroids in the progeny in most cases. The results are consistent with the data of other researchers regarding a decrease in the incidence of asthma and allergy in the progeny if vitamin therapy is used during pregnancy [25]. Other researchers reported that low consumption of fruits, vegetables, and vitamin D as well as consumption of contaminants with food are associated with the risk of uterine fibroids [26].

Moreover, account must be taken of food choices and taste preferences of the mothers of the patients in both groups. The analyzed data show that mothers of the women in the case group preferred a high-carbohydrate diet (sweets and bakery) during pregnancy, in contrast to mothers in the control group, who significantly more often followed a balanced diet including meat, fish, vegetables, and fruits. However, this difference was not significant.

Thus, Harris et al. revealed new links between a woman's food choices and the risk of uterine fibroids formation during her lifetime [27].

Our results are consistent with the opinion of the authors who investigate the important role of nutrition and environmental factors during pregnancy in the development of various diseases in the progeny [28]. Georgieff noted an association between the mother's low iron intake during pregnancy and increased risks of autism, schizophrenia, and abnormal structures formation in the progeny. According to our results, mothers of the patients with uterine fibroids significantly more often resided in rural areas (54.4 vs. 22.2%) and had apparent taste preferences [preferred bakery, dairy products, and carbohydrate foods at a significantly higher rate (43.6 vs. 28.2%)], while mothers of the patients without fibroids consumed meat more often (44.8 vs. 32.8%).

The study has several limitations: firstly, it is the small number of women enrolled ($n = 915$). Secondly, responses given by the mothers of the enrolled women might have contained some distortions due to recall bias and concealment of information. Thirdly, the study does not specify the details of manual work, the number of cigarettes smoked daily, the type of vitamin therapy used, etc., since such life details are difficult to remember. A strength of this study is the use of multivariate analysis, which made the results as accurate as possible.

Conclusion

We presented and summarized the information demonstrating that socioeconomic and medical factors in a woman's life can have a further epigenetic effect on the incidence of uterine fibroids in her daughters. During pregnancy, healthcare professionals should pay attention to the presence or absence of factors associated with uterine fibroids in the offspring. Women residing in rural areas, who more frequently perform heavy manual work and have certain food choices and certain views regarding nutritional support during pregnancy, seem to require special attention. The study showed that educated women residing in cities, who are more likely to use nutritional support during pregnancy and are not involved in heavy manual work, have significantly lower risks of uterine fibroids formation in their daughters.

The results suggest the need for educating pregnant women by healthcare personnel and enhancement of control and screening of women throughout their lifetime if they have maternal epigenetic risk factors associated with uterine fibroids.

Further study of epigenetic fetal genome modifiers, maternal factors, and their contribution to the development of various diseases is one of the promising areas of preventive medicine.

Conflict of Interest: The authors declare that they have no conflicts of interest.

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针对瘦素抵抗背景的外源性体质性肥胖儿童的综合治疗方法
**A COMPREHENSIVE APPROACH TO THE TREATMENT OF
CHILDREN WITH EXOGENOUS CONSTITUTIONAL OBESITY
AGAINST THE BACKGROUND OF LEPTIN RESISTANCE**

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抽象的。在当今刻板印象的社会中，人们普遍认为超重的人无法克服自己的欲望并应对问题。但最近的研究表明，这只是一个结果，更深层次的原因在于身体的生化过程。“饱腹感”激素——瘦素具有特殊的作用。在这项研究中，我们提出并证明了一种治疗外源性体质性肥胖儿童的新方法的有效性，该方法不仅可以减轻体重，还可以消除瘦素抵抗，从而实现长期稳定的缓解。我们获得的结果证明，治疗儿童外源性体质性肥胖的传统方法在不存在瘦素抵抗的情况下“有效”，但不足以应对基于瘦素抵抗的外源性体质性肥胖。通过在综合治疗中添加TCMT，我们消除了瘦素抵抗的迹象，瘦素抵抗影响了治疗期间减肥效果的持续时间。我们建议在内分泌和儿科服务工作中使用个性化方法。

关键词：肥胖、儿童、瘦素、磁疗法、饮食疗法。

Abstract. *In today's stereotyped society, it is generally accepted that overweight people cannot overcome their desires and cope with the problem. But recent studies show that this is only a consequence, and the cause lies much deeper in the biochemical processes of the body. A special role is given to the "satiation" hormone - leptin. In the study, we presented and proved the effectiveness of a new approach to the treatment of children with exogenous constitutional obesity, which allows not only to reduce body weight, but also to eliminate leptin resistance, which leads to a long and stable remission. The results obtained by us prove that the traditional approach to the treatment of exogenous-constitutional obesity in children "works" well in the absence of leptin resistance, but is insufficient to*

cope with exogenous-constitutional obesity, which is based on leptin resistance. By adding TCMT to complex therapy, we achieved the elimination of signs of leptin resistance, which affected the duration of the effect of weight loss achieved during therapy. We recommend using a personalized approach in the work of endocrinological and pediatric services.

Keywords: *obesity, children, leptin, magnetotherapy, diet therapy.*

Introduction. The high incidence of exogenous constitutional obesity in children indicates to modern society an unfavorable trend that has developed among the child population and calls for the community of pediatricians to actively participate in the modernization of algorithms for the prevention and treatment of the disease. Most often, today, the method of treatment of exogenous-constitutional childhood obesity is used, which consists of changing the stereotype of nutrition, reducing the calorie content of food, exercise therapy and the rejection of physical inactivity. But the method is palliative and has a short-term effectiveness, since it is possible to maintain the body weight achieved after weight loss only in rare cases [1]. Therefore, the results of numerous studies are very important for the modern world, proving that leptin reduces appetite and food intake, increases energy consumption, changes the metabolism of fats and glucose, participates in the regulation of the functions of the neuroendocrine, reproductive and immune systems, and is also capable of inducing adipocyte apoptosis [2]. In the last decade, the demand for physical therapies in obese children has increased. The use of magnetic fields is the safest and most popular of them all. The colossal advantage of using this method, unlike other physical influences, is that the child himself, whose body is perfectly amenable to impulses, during the procedure and after it, absolutely does not feel this. This method has a good penetrating ability, which makes it possible to act on the hypothalamus without a thermal effect; wide spectrum of action: anti-inflammatory, immunomodulatory, vasodilating, neurotropic; few contraindications [3]. It can be concluded that successful therapy in obese children should be complex and multidisciplinary. Not only effectively reduce the body weight of the child, but help maintain the effect; well tolerated, does not cause complications and dependence.

Purpose of the study. Improving the effectiveness of treatment of children with exogenous constitutional obesity on the background of leptin resistance.

Material and research methods. We have formed groups:

- I main group (82 people) - children with leptin resistance
- II comparison group (78 people) - children without leptin resistance.

Inclusion criteria: the presence of exogenous-constitutional obesity, age over 7 years and the absence of concomitant diseases in other organs and systems

Children younger than 7 years old were excluded due to the high probability of morphofunctional immaturity of the body, when the correction of overweight can only be a recommendation [4].

In each group, two subgroups were formed, depending on the planned treatment algorithm (Fig. 1).

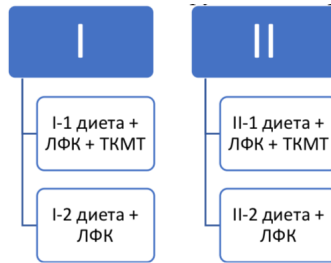


Figure 1. Formation of subgroups

Children were diagnosed and treated on an outpatient or inpatient basis, depending on preferences.

The personalized approach to the treatment of leptin resistance that we developed included not only such standard methods as education, diet therapy, exercise therapy, but also a physiotherapeutic procedure - transcranial magnetotherapy,

The object of the study were 42 children from the main group and 39 children from the comparison group.

The procedure was carried out on the apparatus «AMO-ATOS-E» with the prefix «HEAD» (registration certificate No. FSR 2009/04781 dated 09.06.2009 and No. RZN 2015/3093 dated 09.30.2015):

- One course consisted of 10 procedures
- The child was in a sitting position
- Fixation of the emitter terminals was carried out in the temporal areas of the head
- Traveling magnetic field mode: variable magnetic field
- Frequency increased from session to session from 1 to 10 Hz
- The duration of the procedure also gradually increased from 8 to 15 minutes.

As part of the study, children completed three courses with breaks for 1 month after each. It was not advisable to continue the courses, as in children with initial 1 degree of obesity, after 4 months, the body weight level decreased to the values characteristic of the age norm. The duration of an open controlled and randomized study was 1 year. Before the start of complex therapy, all children with their parents received the most complete information and signed a voluntary

consent. Anthropometric data were evaluated monthly before each course, and bioimpedancemetry was performed [5]. By means of questioning, the severity of clinical manifestations of leptin resistance was assessed. The level of leptin in the blood serum was assessed twice: before the start of therapy and 1 year after the first treatment, together with anthropometry and bioimpedancemetry, in order to evaluate long-term results.

Results of the study and their discussion. The scheme of complex therapy developed by us to eliminate exogenous-constitutional obesity in children with leptin resistance (including children with comorbid pathology) consisted of: diet therapy, moderate daily physical activity and transcranial magnetotherapy. Therefore, all children had to follow the principles of a dietary approach, healthy full sleep and daily exercise therapy.

Recall that children from the main group and the comparison group of subgroups I received standard therapy for weight loss (diet therapy and exercise therapy) and transcranial magnetotherapy, while children from subgroups II observed only the principles of diet therapy and performed daily physical activity.

The children underwent 3 courses of transcranial magnetic therapy with an interval of 1 month. Bioimpedancemetry was carried out monthly, anthropometric data were measured and signs of leptin resistance were recorded. Before treatment and a year later, the level of leptin in the blood serum was measured and the parameters of respiratory function were analyzed.

In the main group in children with leptin resistance and in the comparison group before the start of complex therapy, body weight in subgroups I and II was increased in all children according to the degree of obesity and did not differ statistically.

A month after therapy in children with exogenous constitutional obesity on the background of leptin resistance, in both subgroups, regardless of the therapy received, there was a highly significant weight loss compared to baseline ($p < 0.001$). But in children receiving magnetotherapy, starting from the 1st course, lower values of body weight were observed ($p = 0.014$ at the 1st visit and $p < 0.001$ at subsequent visits). The degree of weight loss - that is, the difference from the initial value - in the studied subgroups also turned out to be different. Thus, in subgroup I with TCMT after the 3rd course, there was a decrease in body weight by 7.10 ± 3.90 kg (by 9% of the original), while in subgroup II there was a decrease only by 1.54 ± 0.85 kg (by 2.8% relative to baseline) ($p < 0.001$).

Signs of leptin resistance in children on the background of TCMT became less noticeable, and most children after 2 months noted a decrease or even the absence of the majority, in contrast to children who did not receive TCMT.

A year after therapy, in children who completed 3 courses of TCMT, the outlined trend continued: in 95% of children, the weight continued to decrease, and

only two people (4.8%) increased the weight. And in the vast majority (97.5%) of children receiving standard therapy, on the contrary, the weight returned to the initial level or even slightly increased.

Thus, after the cessation of TCMT courses, 1 year later, in children in subgroup I, the body weight reached 47.42 ± 15.18 kg, and in subgroup II, on the contrary, the weight increased by 1.99 ± 1.73 kg ($p < 0.001$).

In children without leptin resistance, who underwent transcranial magnetic therapy, the weight after 1 month (after 1 course) decreased by 4.1%, after 2 courses by 8%, and after 3 courses by 12%. In the group of children with no leptin resistance, who did not undergo transcranial magnetic therapy, the intensity of weight loss was actually reduced by half: after 1 month (after 1 course), body weight decreased by 3%, after 2 courses by 6% and after 3 courses by 9%.

With both approaches to body weight correction in children with exogenous constitutional obesity without leptin resistance, a decrease in body weight was observed compared with the baseline ($p < 0.001$). Although the degree of reduction was greater in subgroup I, where magnetic therapy was included in the complex therapy.

Thus, over the year, in children with exogenous constitutional obesity without signs of leptin resistance after receiving a course of TCMT, the weight decreased by 15.4%, and in children with a similar history, but without undergoing TCMT, by 10.7% of the initial weight body ($p = 0.002$).

Considering subgroups I identical in therapy, including TCMT and comparing children with the presence and absence of leptin resistance, we found that the body weight itself in these children did not statistically differ, although the degree of reduction from 1 to 3 courses of therapy was more pronounced in children in comparison group, without leptin resistance. Therefore, the presence of additional TKMT in the treatment regimen allows us to speak of almost identical body weight correction in both groups. This confirms the high efficiency of TCMT in children with leptin resistance.

Now let's present the statistical data of children with and without leptin resistance who did not take a course of TCMT.

Children of subgroup II with leptin resistance, who underwent a course that included only the traditional approach to the treatment of exogenous-constitutional obesity, returned to their original body weight a year after the start of treatment. And in children without leptin resistance from the comparison group, with the same approach, body weight indicators remained fairly stable after a year.

The obtained results once again prove that the traditional approach to the treatment of exogenous-constitutional obesity in children «works» well in the absence of leptin resistance, but is insufficient to cope with exogenous-constitutional obesity, which is based on leptin resistance.

Undoubtedly, the etiological factor of exogenous constitutional obesity, new for the Samara region, is very important and cannot be completely eliminated using standard complex therapy, which consists only of diet therapy and daily physical activity. Like TCMT, being outside the scope of complex therapy, it also cannot be sufficiently effective.

The level of leptin after a year in children in the main group who underwent complex therapy with TCMT decreased from 41.15 ng/ml to 20.30 ng/ml (<0.001). And in children who did not correct leptin resistance using TCMT, a year later, on the contrary, there was an increase in leptin concentration from 47.65 ng/ml to 52.66 ng/ml. ($p<0.001$), intergroup differences became highly significant ($p<0.001$).

And in the children of the comparison group, after weight correction, the level of leptin in the blood serum, regardless of the treatment received, decreased ($p<0.001$) and became statistically distinguishable: 21.90 ng/ml in subgroup I and 34.23 ng/ml in subgroup II subgroup ($p=0.33$).

Prior to treatment, serum leptin levels were equally high in both groups and did not differ statistically. However, after a year of observation in children with leptin resistance, its concentration increased, while in children without leptin resistance it decreased ($p=0.016$).

This again indicates a high sensitivity of leptin to even a slight increase in body weight.

The parameters of respiratory function in children with exogenous constitutional obesity in the main group and the comparison group, regardless of the therapy received, changed in direct proportion to body weight transformations. But remained in direct proportion to the degree of obesity.

That is, changes in the parameters of respiratory function were of great clinical significance, which confirms the theory of comorbidity (the interdependence of exogenous constitutional obesity and bronchopulmonary pathology on the example of BA), and also indirectly affects the choice of a complex therapy regimen in children with exogenous constitutional obesity.

Summing up, we can draw the following conclusion: by adding TCMT to complex therapy, we achieved the elimination of signs of leptin resistance, which apparently affected the duration of the effect of weight loss achieved during therapy.

Conducted monthly bioimpedance analysis of body composition in all children proved that body weight decreased due to a decrease in the percentage of adipose tissue in the body, which also confirmed the correctness of the chosen therapy regimen.

A prospective study was conducted to evaluate the effectiveness of a complex therapy regimen for exogenously constitutional obesity with leptin resistance, including TCMT. It included 160 children with exogenous-constitutional obesity of I-III degree, including:

- 82 children with exogenous-constitutional obesity of I-III degree with leptin resistance (including 12 children with comorbid pathology). Divided into I (TCMT was included in the therapy regimen) and II subgroups (TCMT was not included in the therapy regimen);

- 78 children with exogenous-constitutional obesity of I-III degree without leptin resistance (including 7 children with comorbid pathology). Divided into I (TCMT was included in the therapy regimen) and II subgroups (TCMT was not included in the therapy regimen);

During the observation, a positive result was obtained:

- in the main group I subgroup, 40 children had a positive result and 2 children had a negative result;

- in the main group II subgroup, 1 child received a positive result and 39 - a negative one;

- in the comparison group of subgroup I, 38 children had a positive result and 1 child had a negative result;

- in the main group II subgroup, 34 children received a positive result and 5 had a negative result.

With the help of a mathematical evaluation of the data obtained, we were able to determine the effectiveness of the proposed complex therapy.

The therapy regimen, including diet therapy, daily physical activity and TCMT, showed high efficiency of use, especially in children with leptin resistance. Thus, this technique can be used in the treatment of exogenous constitutional obesity in children, especially in the presence of leptin resistance.

Conclusions. The developed scheme of personalized treatment in children with exogenous constitutional obesity on the background of leptin resistance allows to reduce body weight by eliminating leptin resistance and maintain the effect achieved during therapy for a long time (I -1: 54.52 ± 18.25 - before treatment, $49, 61 \pm 16.61$ - at the end of treatment, 47.42 ± 15.18 - a year later).

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关节式和静态垫片治疗膝关节假体周围感染
**ARTICULATING AND STATIC SPACERS IN THE TREATMENT
OF PERIPROSTHETIC KNEE INFECTION**

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抽象的。大关节置换术后最显著的并发症是假体周围感染，最有效的手术治疗方法是两阶段翻修关节置换术。假体周围感染的药物策略是局部（借助特殊装置 - 垫片）和全身抗生素治疗的结合。对于任何特定类型的垫片的好处尚未达成共识。一项连续回顾性研究的目的是评估在联邦创伤学和骨科中心的条件下使用关节和静态垫片进行两阶段重建假体治疗膝关节假体周围感染的 91 例患者的 83 例结果。结果，根据 KSS 量表，与静态使用关节垫片相比，使用关节垫片显示出更好的关节功能恢复 ($p=0.0165$)。垫片类型对 VAS 量表上的疼痛严重程度没有统计学上的显著影响 ($p=0.1325$)。根据 EQ-5D 和 EQ-VAS 问卷，第 1 组获得了对生活质量和健康满意度的最佳结果 ($0.0296 < p > 0.0309$)。关节垫片组中未出现感染复发/致死率的良好结果是一个优势 (87.3% 对比 68.8% 的病例 ($p=0.0324$))。需要对感染的膝关节进行逐步修正的患者 对于具有令人满意的骨组织状态的关节，我们认为最好使用动态垫片。

关键词：假体周围感染； 关节翻修术； 铰接垫片； 静态垫片。

Abstract. *The most significant complication after arthroplasty of large joints is periprosthetic infection, the most effective method of surgical treatment of which is a two-stage revision arthroplasty. Drug tactics for periprosthetic infection is a combination of local (with the help of special devices - spacers) and systemic antibiotic therapy. There is no consensus on the benefits of any particular type*

of spacer. The purpose of a continuous retrospective study was to evaluate 83 outcomes of 91 cases of treatment of periprosthetic infection of the knee joints using a two-stage re-endoprosthetics using articulating and static spacers in the conditions of the Federal Traumatology and Orthopedic Center. As a result, the use of articulating spacers showed a better recovery of joint function according to the KSS scale in comparison with static ones ($p=0.0165$). The type of spacer did not have a statistically significant effect on the severity of pain on the VAS scale ($p=0.1325$). The best results of satisfaction with the quality of life and health according to the EQ-5D and EQ-VAS questionnaires were obtained in group 1 ($0.0296 < p > 0.0309$). The favorable outcome in the form of no recurrence of infection/lethality in the group of articulating spacers was an advantage (87.3% vs. 68.8% of cases ($p=0.0324$). Patients requiring a step-by-step revision for an infected knee joint with a satisfactory state of the bone tissue, in our opinion, it is preferable to use a dynamic spacer.

Keywords: *periprosthetic infection; revision arthroplasty; articulating spacer; static spacer.*

Introduction

The most significant reason for revision prosthetics after arthroplasty of large joints is an infectious complication. Two-stage revision arthroplasty remains the most effective method of surgical treatment of chronic periprosthetic infection to date [1].

Drug tactics for periprosthetic infection is a combination of local (with the help of special devices made of antibiotic-impregnated cement - spacers) and systemic antibiotic therapy (intravenous and/or oral). The use of polymethyl methacrylate bone cement with an antibiotic for the purpose of sanitizing the focus of infection in the bone tissue began to be used as early as 1970 [2]. Such bone cement has proven itself as a means of local delivery of water-soluble thermostable antibiotics and is still used in both primary and revision surgery [3]. Other tasks of the spacer are filling the bone tissue defect after the removal of the endoprosthesis, preventing the formation of hematomas, maintaining the length and supportability of the limb.

To date, a number of spacers have been developed - static, articulating, cement, from the components of endoprostheses, however, there is no consensus on the advantages of any particular type.

The question remains whether there are significant differences between articulating (dynamic) and static spacers for the treatment of knee prosthesis infections in terms of recurrence of infectious complications, recovery of knee joint function, and patient satisfaction with treatment results.

The aim of the study was to evaluate the outcomes of treatment of periprosthetic infection of the knee joints by the method of two-stage re-endoprosthetics using articulating and static spacers at the first stage of sanitation.

Materials and methods

Based on the data of the medical information system, a complete retrospective analysis of cases of infectious complications after total knee joint (KJ) was carried out, treated in the conditions of the Federal Center for Traumatology, Orthopedics and Arthroplasty of the Ministry of Health of Russia (Cheboksary), hereinafter referred to as the Center, using static or articulating spacers at the first stage of debridement. At the second stage of sanitation, the patients underwent re-endoprosthetics with the installation of an implant. Depth of the study - 5 years (2014-2018). The sample was divided into two groups: 1 - patients who had an articulating spacer installed at the first stage of sanitation (n=72); 2 - patients who had a static spacer installed (n=19).

According to the protocol of the operation, the volume of blood loss, the duration of the surgical intervention, the time of using the tourniquet, the presence or absence of drainage after the operation, and the volume of the bone defect were evaluated. To assess the volume of a bone defect, the International Classification of a Bone Defect according to AORI (USA), 1997 was used: type I - intact bone, type II - damaged bone, type III - bone deficiency. To assess the localization of the defect, abbreviations were used: F, Femur (femur) and T, Tibia (tibia).

Conducted a microbiological study of intraoperative biomaterial - tissue biopsy - taken at the first stage of the revision intervention.

At the stage of evaluating the outcomes of treatment, patients with the ineffectiveness of the first stage of sanitation in stopping the infectious process and the absence of the second stage of sanitation for any reason ("life with a spacer") were excluded from the study. Treatment outcomes were assessed: 1) by restoring the functional activity of the operated knee joint using the KSS scale; 2) to reduce the severity of the pain syndrome after the revision intervention using the VAS visual analog scale; 3) according to patient satisfaction with the treatment performed based on the EQ-5D, EQ-VAS scales. Treatment success was defined as the absence of CDP recurrence after two-stage surgery and/or death from any cause. Treatment outcomes were assessed at a mean follow-up of 6.4 years (CI=95%; SD=1.7; 1.8-12).

Statistical data processing was performed using MS Office Excel, 2007 (Microsoft, USA) and Graf Pad software. In a normal distribution, the trait was described using its mean value and standard deviation with 95% CI. To assess the effectiveness of the treatment in groups, the exact Fisher test was calculated. Differences in indicators between groups were considered statistically significant at $p < 0.05$.

results

The study groups were comparable in terms of gender, age, the average number of previous surgical interventions on the joint, the time period between the first and second stages of sanitation (Table 1). The mean follow-up period in the groups was 6.3 years and 7 years, respectively ($p=0.4723$).

Table 1
Characteristics of study groups

Study characteristics/groups	1 group (n=72) articulating	2 group (n=19) static	P
Age	63.0±9.5 (95% CI: 60.8-65.2)	61,7±6,6 (CI 95%:58,5-64,9)	0,5298
Sex	M - 48 (66.7%) F - 24 (33.3%)	M - 14(73,4%) F - 5(26,3%)	0,7826
Average number of operations prior to the present	0.4±0.9 (95% CI: 0.2-0.6)	0,8±1,3 (CI 95%:0,2-1,5)	0,1055
Period between stages of treatment, days	768.6±773.9 (95% CI: 586.7-950.4)	920,5±855,5 (CI 95%:508,2-1333)	0,4685

The study groups were comparable in terms of the time of surgery, the duration of the tourniquet installation, blood loss, and the presence or absence of drainage ($p>0.05$) (Table 2).

Table 2
Characteristics of surgery at the stage of spacer installation

Indicators/groups of observation	1 group (n=72)	2 group (n=19)	P
Operation time	92,9±34,6 (CI 95%:84,8-101,0)	83,8±15,9 (CI 95%:76,1-91,5)	0,6536
Tourniquet time	64,9±19,3 (CI 95%:56,4-73,5)	74,7±13,0 (CI 95%:62,7-86,7)	0,2285
blood loss	263,38±217,2 (CI 95%:212,0-314,8)	313,2±292,3 (CI 95%:172,3-454,0)	0,7390
Drainage installed after surgery	51 (70,8%)	13 (68,4%)	1,0000

Bone defects of type II were more often diagnosed in patients of group 1 ($p=0.0015$), bone deficiency of type III - in group 2 ($p=0.0001$), which probably explains the surgeon's choice of static spacers to create stability of the structure with large bone deficiency (Table 3).

Table 3*International classification of bone defect according to AORI (USA), 1997*

Defect Types/Observation Groups	1 group (n=72)	2 group (n=19)	P
I type (F1 and T1)	20 (27,8%)	5 (26,3%)	1,0000
II type (F2 and T2)	49 (68,0%)	5 (26,3%)	0,0015*
III type (F3 and T3)	3,0 (4,1%)	9 (47,4%)	0,0001*

*statistically significant differences

In the structure of the microbiological landscape in both groups, staphylococci prevailed (47.3% and 63.2% of cases in patients of groups 1 and 2, respectively). In the structure of coagulase-negative staphylococci, the proportion of methicillin-resistant strains in both groups totaled 75%. In isolated strains of *Staphylococcus aureus*, methicillin- or vancomycin-resistant strains were not found. Attention is drawn to the fact that gram-negative microorganisms were detected 3 times more often in patients of group 2 (2.8% vs. 10.5% of cases, $p=0.1911$). Negative results of microbiological examination in the presence of clinical signs of PJI were registered in 26.3-31.9% of cases.

At the stage of evaluating the results of treatment, it was revealed that all patients at the first stage of sanitation received positive results of the sanitation of the infectious process, however, there were cases when the second stage was not performed for various reasons, and patients were forced to continue “life with a spacer” (5 people - in 1 group and 3 - in the second). This category of patients was excluded from the follow-up and, thus, treatment outcomes were evaluated in 67 and 16 cases. Outcomes in group 1 (87.3%) are more favorable than in group 2 (68.8%): 6 relapses versus 2; lethal outcomes ($n=3$) were noted only in group 2. Thus, favorable outcomes were more common in group 1 ($p=0.0324$). Arthrodesis at the second stage of sanitation in group 2 was performed in more than half of all cases ($n=9$), in group 1 there were no such cases.

The use of articulating spacers (Group 1) ultimately showed a better recovery of joint function according to the KSS scale compared to static spacers (Group 2): 69.5 vs. 45.6 points ($p=0.0165$). The type of spacer had no statistically significant effect on the severity of pain on the VAS scale (4.3 and 5.9 points in groups 1 and 2, respectively, $p=0.1325$). The best results of satisfaction with the quality of life and health according to the EQ-5D and EQ-VAS questionnaires (0.6 and 72.6 versus 0.4 and 56.2 points, respectively) were obtained in group 1 ($0.0296 < p > 0.0309$).

Discussion

There is no consensus on which type of spacers (static or articulating) is advantageous in the treatment of chronic periprosthetic infection using two-stage arthroplasty. A randomized trial (68 patients, 2020) showed that at a follow-up

period of 3.5 years, the range of motion in the knee joint was greater in the group of articulating spacers and amounted to 113.0° (95% CI; $108.4-117.6^{\circ}$; $p=0.001$), with a better quality of life - 79.4 points compared to 69.8 points (CI=95%; 72.4-86.3 and 63.6-76.1, respectively; $p=0.043$) [4]. Our results once again confirmed the superiority of articulating spacers over static spacers in improving knee function. According to the KSS knee and functional scores, the dynamic spacer may subsequently give the knee joint more room to develop, thereby improving the patient's condition. In another study (121 cases of treatment with static spacers at a follow-up period of 3.7 years), satisfactory results were shown for further development of the knee joint: in 67 cases, full extension was achieved, none of the patients developed flexion contracture $>10^{\circ}$, the average flexion angle was 100° (range $60-139^{\circ}$), and 39 joints had postoperative flexion $>120^{\circ}$, with a successful treatment rate without recurrence of CDP of -94% [5].

Although articulating spacers in knee arthroplasty can provide increased range of motion and function, there are concerns about their use in cases of instability and bone loss [6]. Our study demonstrates the choice of static spacers for large bone defects. This is also consistent with some current evidence that patients using static spacers are more likely to experience bone loss [7].

Lichstein P. et al. (2016) reported that in a study of patients with an implanted static spacer, 25% of microorganisms isolated at the first stage of the procedure were resistant to methicillin and/or vancomycin [5]. The high proportion of methicillin-resistant staphylococci in our study (75%) may indicate the progression of antibiotic resistance; at the same time, the isolated microorganisms showed no resistance to vancomycin. Also, resistant strains of *Staphylococcus aureus* have not been isolated.

In the works of other researchers, an analysis was made of the frequency of re-infection in the knee joint (recurrence of periprosthetic infection), no differences were found when using static and articulating spacers [8]. These data were confirmed in the study group of patients with infection eradication ($n=176$) at a follow-up period of 5 years with a success rate in both groups: 83.7% in the group with an articulating spacer and 86.1% in the group with static spacers ($P=0.234$) [9]. A 2022 review of 13 studies included in PubMed, Web of Science, Cochrane Library, and Embase showed no significant difference in periprosthetic infection recurrence between dynamic and static spacers [RR: 1.03; 95% CI 0.98, 1.09; $P = 0.179 > 0.05$] [10].

However, Warwick HS et al. in a retrospective review of 229 periprosthetic joint infections found a higher rate of treatment failure with static spacers (odds ratio 2.17, $P=0.009$) [11]. Our study also showed a higher failure rate and dissatisfaction with treatment outcomes with static spacers, which may be due to the fact that a static spacer is more often installed in patients with signs of severe infection, large bone loss and severe soft tissue damage.

The conducted study had a number of limitations, since it was retrospective in nature and was represented by a small sample. The tactics of choosing a static or articulating spacer depended on the priorities of the surgeon. A static spacer was favored by a large loss of bone mass, a burdened somatic status of the patient due to comorbidity (with the impossibility to perform the second stage of re-endoprosthetics in the future) and the risk of instability of the installed structure.

Conclusions

Treatment of periprosthetic infection with an articulating spacer, in contrast to a static spacer, led to an improvement in the functional result according to the KSS scale with a higher level of patient satisfaction with the standard of living according to the EQ-5D and EQ-VAS scales at the follow-up stage with the same decrease in the severity of pain syndrome. The favorable outcome in the form of no recurrence of infection/lethality in the group of articulating spacers was an advantage (87.3% vs. 68.8% of cases ($p=0.0324$)). Patients requiring a step-by-step revision for an infected knee joint with a satisfactory state of the bone tissue, in our opinion, it is preferable to use a dynamic spacer.

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关于儿童自体牙齿移植的现代表述
**MODERN REPRESENTATIONS ABOUT AUTOTRANSPLANTATION
OF TEETH IN CHILDREN**

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抽象的。该研究的目的是调查有关自体牙齿移植的现代表现。对2012年至2022年10年的31个文献来源进行了分析。作者关于自体牙齿移植的结论表明该手术非常成功。

关键词：自体移植、牙齿缺失、牙列更换。

Abstract. The aim of the study was to investigate modern representations about autotransplantation of teeth. The analysis of 31 sources of the literature for 10 years from 2012 to 2022 was carried out. The conclusions of authors about autotransplantation of teeth indicate a high level of success of the operation.

Keywords: autotransplantation, loss of teeth, replacement of the dentition.

To date, the loss of permanent teeth in children is an urgent problem. The causes of tooth loss are different: caries and its complications – 57%, trauma – 32,6%, adentia – 6,3%, neoplasms and local inflammatory processes – 2,3%, retention - 1. There are different ways to restore lost teeth (orthodontic repositioning, implantation, autotransplantation) [1,2,3,4].

The analysis of modern ideas about autotransplantation of teeth in children, the effectiveness of this operation was carried out (Table 1).

Table 1.
Profile of the study

Trials (n=31)			
randomized clinical trials	reviews, systematic reviews	clinical trials in vivo	description of clinical cases
3 (4%)	7 (14%)	3 (6%)	18 (76%)

We studied 31 sources of literature for a period of 10 years from 2012 to 2022. When studying scientific works, the conditions necessary for successful autotransplantation, the technique of the operation, possible complications after the operation and ways to prevent them were determined.

Autotransplantation is a good method for restoring teeth. Autotransplantation achieves the cessation of bone tissue atrophy, changes in the position of adjacent teeth, and also treats cosmetic defects in the dentition, normalizes the function of the dentoalveolar system [5, 6].

It is known from the literature that with the correct application of these techniques in most patients, it was possible to obtain satisfactory results in the long term. Since implantation is absolutely contraindicated in children under 18 years of age, due to skeletal growth, an alternative is the operation of autotransplantation [1,4].

Autotransplantation of a tooth is the removal of a tooth from one area and its replantation in another area in the same person. In this case, a new place can be a fresh hole after tooth extraction or an artificially formed hole in the edentulous area of the jaw. Supernumerary teeth and third molars are most often used as autografts in children, however, depending on the clinical situation, temporary teeth and permanent premolars in the growth stage can be used as autografts [4,7,8,9].

The success of the operation depends on the quality and stage of development of the transplanted tooth, the availability of a place for its transplantation, the presence of bone tissue in the recipient area, and the general health of the patient.

Autotransplantation of teeth includes the following stages: clinical and radiographic examination, diagnosis, treatment planning, surgical procedure, endodontic treatment, orthodontic treatment, aesthetic restoration and follow-up for five years. Dental autotransplant planning is not an isolated surgical procedure after tooth loss, but an operation as part of a comprehensive treatment aimed at stable and aesthetic occlusion in the long term. Moreover, unlike other approaches to treatment, autografted teeth still have the ability to functionally adapt [4,10,11,12,13].

The standard surgical technique includes anesthesia, where most authors use nitrous oxide sedation and local anesthesia, and general anesthesia is possible.

The next stage is the removal of the donor tooth: it is necessary to preserve the amount of periodontal ligament on the root of the tooth as much as possible. The

anatomical shape, size (mesiodistal width of the root and crown, root length), the condition of the periodontal ligament are important. The preparation of the well is carried out with surgical burs at low speed and cooling. Next, the doctor fits the tooth, after which he cuts and sutures the flap. The recipient bed should be 10% larger than the tooth size. The final stage is splinting of the donor tooth (using sutures or a flex wire with a composite), occlusal correction - removal of the tooth from the bite, radiographic assessment and surgical dressing [3,14-19].

There is evidence that autotransplantation of teeth with incomplete root formation shows better engraftment and high success rates with a low number of complications. However, there are complications. Common after autotransplantation are: ankylosis (from 2% to 18,2%), root resorption (from 3% to 10%), less often pulp necrosis and tooth hypermobility [2,20].

Good engraftment of the tooth depends on the following factors: the preservation of the periodontal ligament in the donor tooth, the time from the moment of its extraction from its own hole and replantation, the surface area of the damaged root (cells programmed to form bone tissue are attached to the damaged areas of the root, and the dentin is replaced by bone, ankylosis is formed [21-24]. Replacement resorption depends on the age of the patient. The replacement resorption rate is proportional to the patient's bone remodeling rate: up to 50% per year in children, about 2% per year in adults [25, 26].

If successful, there is a rapid regeneration of bone tissue and the appearance of a compact plate around the graft. Bone graft materials are not needed even if the space between the tooth and the bone is wide [3,27].

If the donor tooth is in the stage of root formation and Hertwig's root sheath is preserved around the apex, further root development after autotransplantation can be expected. The donor tooth is considered ideal if it has the maximum root length, but an open apex about 1 mm radiographically. To control postoperative resorption or apical periodontitis, as well as to monitor the healing of the pulp (in the transplantation of developing teeth), it is necessary to conduct x-ray control every month for 3 months [28]. If there are signs of pulp and periodontal infection, endodontic treatment should be carried out as soon as possible. If there are no signs of infection, a second radiograph is taken after 6 months [3,4,29,30]. Transplantation of a mature root negates the potential for pulp regeneration, but endodontic treatment will still provide success [3,31].

When transplanting teeth into the anterior region, restoration of teeth is necessary, since it is necessary to create an aesthetic smile, ensure habitual occlusion and normal approximal contacts [4].

There are criteria for successful autotransplantation: the transplanted tooth has normal clinical and radiographic findings, no ankylosis, no resorption or infection; the ratio of crown and root is normal; normal mobility and gingival contour; phys-

iological level of mobility, normal depth of the gingival pocket. The criteria for failure are as follows: the tooth has an unacceptable clinical appearance, the tooth has mobility, ankylosis, progressive resorption, or infection [2-4].

After autotransplantation, the roots of the teeth continue to develop and a normal periodontal ligament is formed. These teeth can be moved orthodontically like any other tooth that has erupted and is in occlusion. In general, it is recommended to wait for an observation period of three to four months before applying orthodontic forces on these teeth [32, 33].

Survival rates for autotransplantation vary from 74 to 100% with different follow-up periods and types of transplanted teeth. According to the literature, survival up to one year is 98%, two years 97%, three years up to 97% [3, 34, 35].

Clinical case

We present a clinical example of autotransplantation of tooth 2.8. in place 3.6. Patient V., 17 years old (Figure 1,2).

Based on the analysis of clinical and radiological data, a diagnosis of S02.5 “fracture of tooth 3.6” was established, complicated by exacerbation of chronic periodontitis. Tooth 3.6 removed. The hole is prepared for autotransplantation of tooth 2.8. Tooth 2.8. removed and replanted in place of tooth 3.6. Replanted tooth splinted. A week later, primary endodontic treatment was performed with filling the root canals with a paste based on calcium hydroxide. After 2 weeks, the composite reinforced tire was removed. After another 3 weeks, the final filling of the root canal system with gutta-percha with endo-sealant based on epoxy resin was carried out. The tooth was restored with composite.



Figure 1. Photo of a replanted tooth before and after restoration

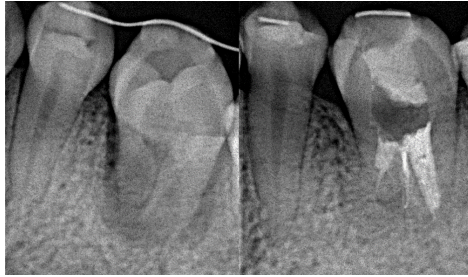


Figure 2. Radiograph of an autotransplanted tooth after transplantation and six months later

Dynamic control over the course of bone tissue healing was carried out after 6 months. During the control examination, the clinical well-being of the state 3.6. was revealed. The X-ray picture is characterized by the absence of root resorption and the presence of a compact plate of bone tissue.

Conclusion

At the present stage, the method of tooth autotransplantation, subject to indications and protocols, has high efficiency and long-term stability. Dental autotransplantation is not only an alternative to treatment, but also the only viable option for the functional, aesthetic and social rehabilitation of these patients.

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杏仁核复合体中央核在应激状态下大鼠全身血流动力学调节中的作用
**THE ROLE OF THE CENTRAL NUCLEUS OF THE
AMYGDALA COMPLEX IN THE REGULATION OF SYSTEMIC
HEMODYNAMICS OF RATS UNDER STRESS**

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注释。杏仁核复合体对心血管系统活动的许多参数具有显著影响：血压、心率、血管张力等。由于杏仁核是下丘脑外皮质激素系统的环节之一，因此该结构影响动物的应激依赖性行为，在启动情绪反应方面发挥着重要作用。对杏仁核复合体中央部分在心血管系统活动调节中的作用的研究是在完整的和受到电解破坏的杏仁核中央核上进行的。根据研究中获得的数据，显示当给予氢化可的松时，压力参数发生变化，并且心率值在整个实验过程中略有变化，可以假设杏仁核中央核增加了音调自主神经系统的交感部分，从而增加其对血管张力的影响。我们认为，杏仁核的这种影响主要是通过下丘脑通路实现的，而不是通过与延髓的连接来实现的。

关键词：杏仁核复合体，全身血流动力学，应激，大鼠心血管系统。

Anotation. *The amygdala complex has a significant impact on many parameters of the activity of the cardiovascular system: blood pressure, heart rate, vascular tone, and others. Since the amygdala is one of the links of the extrahypothalamic system of corticoliberin, the structure affects stress-dependent behavior in animals, plays an important role in initiating an emotionally motivated response. The study of the role of the central divisions of the amygdala complex in the regulation of the activity of the cardiovascular system was carried out on intact and subjected to electrolytic destruction of the central nucleus of the amygdala. Based on the data obtained in the study, it was revealed that when hydrocortisone is administered, the pressure parameters change, and the values of the heart rate change slightly throughout the experiment, it can be assumed that the central nucleus of the amygdala increases the tone of the sympathetic part of the autonomic nervous system, thereby increasing its effect on the tone of blood vessels. In our opinion, this influence of the amygdala is realized primarily through the hypothalamic pathway, and not by means of connections with the medulla oblongata.*

Keywords: *amygdala complex, systemic hemodynamics, stress, cardiovascular system of rats.*

INTRODUCTION

The central nucleus of the amygdala complex is part of a system called the expanded amygdala, localized within the basal forebrain. Since the enlarged amygdala is one of the links of the extrahypothalamic system of corticoliberin, it affects stress-dependent behavior in animals, plays an important role in initiating an emotionally motivated response in individuals and mediates the anxiogenic effects of corticoliberin [1]. Corticoliberin acts as a corticotropin-releasing factor, and the receptors for this hormone (R1 and R2) in the brain are localized in all areas, but with different densities [2]. Receptors of the first type (CRG – R1) are present in the neocortex, in the structures of the olfactory brain, amygdala, hippocampus, cerebellum (regulation of adrenocorticotrophic hormone secretion, anxiety control). Unlike the first CRG – R2 practically do not occur in the cortex, and their greatest concentration is present in the ventromedial nucleus of the hypothalamus, the lateral septum, the nuclei of the terminal strip and some nuclei of the MK. This type of receptors is involved in the regulation of eating, sexual behavior and the activity of the cardiovascular, reproductive systems [3].

It has been shown in sufficient detail in the literature that the destruction of the central and lateral amygdala nuclei significantly reduces the development of a stress response in an animal and increases the expression of corticoliberin mRNA in the amygdala and hypothalamus [4]. While stimulation of the central and cortical nuclei of the amygdala increases the secretion of hormones of the pituitary-adrenal system and changes the vector of stress behavioral response. Which demonstrates its activation effect on the hypothalamus. It is known that signals from the noradrenergic and dopaminergic nuclei of the brain follow through the amygdala complex to the hypothalamus. In this case, it acts as a terminal field and is the site of interaction of corticoliberin with many mediators and neurohormones, due to which another regulatory circuit is closed, which is directly related to the emotional coloring of the stress response [5].

It has also been shown that amygdala stimulates the pituitary-adrenal system, thereby increasing the release of glucocorticoids into the blood. There is evidence that with negative emotions, an increase in the level of glucocorticoids often persists for a long time (from 12 hours to a day). This fully explains the extent of the course of emotional stress reactions even after the cessation of exposure to neurogenic factors causing stress [6].

MATERIALS AND METHODS OF RESEARCH

The study was carried out on 24 mongrel sexually mature female rats who were at the stage of diestrus with the exception of the possibility of pregnancy of experimental animals. The body weight of female rats is 240 - 320 grams. Two groups of animals: experimental (12 individuals) and control (12 individuals), were kept in separate cages with unlimited access to food and water.

The animals of the experimental group were subjected to the standard procedure of local electrolytic destruction of the central core of the almond-shaped complex by an anode current (0.1 A, 10 s.). The active electrode with a diameter of 100 microns was made of stainless steel and covered with double lacquer insulation. The active part of the electrode was released from insulation at a distance of 1 mm corresponding to the average vertical size of the core. An indifferent stainless steel electrode was fixed on the ear. The control group was injected with an electrode according to the coordinates of the structure (P - 1.8 mm, L - 3.8 mm, V - 7.8 mm in accordance with the atlas of the rat brain [7]) without the influence of current. The recovery postoperative period lasted seven days, during which antiseptic and aseptic measures were carried out.

To simulate stress in female rats, the drug Hydrocortisone Richter (Gedeon Richter Plc) was used, administered at the rate of 1 mg per 100 g of animal weight. Hydrocortisone is a glucocorticoid agent with an anti-inflammatory effect that suppresses the formation of antibodies and reduces the number of circulating T- and B lymphocytes, monocytes, eosinophils and basophils. The drug is metabolized in the liver and excreted in the form of metabolites by the kidneys, the half-life is 80-120 minutes [8]. Based on the half-life of the drug in an hour and a half, it was decided to register data an hour and a half after the introduction of the substance and 3 hours later, which clearly demonstrates the absence (metabolism of hydrocortisone) or the development of a stress reaction in female rats against the background of the drug administration.

Before and after stress modeling, blood pressure indicators were recorded in animals and the ratio of different forms of leukocytes in smears of native peripheral blood was studied as an indicator of the severity of the stress reaction. The blood pressure of rats was measured by a non-invasive method using the CODA Monitor device (Kent Scientific Corporation). In the experiment, five parameters were registered in awake rats: systolic pressure, diastolic pressure, mean pressure, heart rate, minute blood volume, pulse pressure (calculated from the data obtained). To account for the measurement error, the registration of the initial indicators was carried out several times with the subsequent calculation of the mode.

Native blood smears stained using the Romanovsky-Gimza method (factory solution of Romanovsky-Gimza paint, microscoped (lens 90) with immersion, 200 cells were fixed, followed by the ratio of various forms of leukocytes.

Statistical processing of the initial volume of data was carried out using a specialized program Sigma Plot 12.5 (SYSTAT Software). For statistical calculations, calculate the following parameters: the average value of the samples, the error of the average, the median of the sample distribution. The t-test and the Mann-Whitney test were used to compare the samples. Differences with a significance level of $p < 0.05$ were considered significant.

RESEARCH RESULTS

The influence of the central nucleus on the systemic hemodynamics of rats.

In the study, when assessing the main parameters of the cardiovascular system at rest in females with a destroyed central nucleus of the amygdala complex and in falsely operated rats, it was found that control rats at rest have higher systolic pressure, diastolic pressure and mean pressure, which does not contradict the experimental data presented in the works of physiologists Sanders and Folkow with co-authors. Folkow, in an experiment carried out on 6-week-old spontaneously hypertensive (SHR) rats with a bilateral destroyed amygdala, as well as falsely operated SHR rats, did not record an increase in blood pressure in individuals with a destroyed central nucleus of the amygdala complex compared with the control [9]. Sanders carried out an experiment on male borderline hypertensive rats (BHR), destroying and falsely destroying the central amygdala nuclei with electric current, recorded variations in blood pressure and heart rate at rest. The researcher recorded that the destruction of the central nucleus significantly reduces the values of blood pressure and heart rate [10].

Data on changes in heart rate during the destruction of the central nucleus of the amygdala are very contradictory. In a series of studies by Kapp and co-authors [11] conducted on New Zealand rabbits, opposite data were obtained on changes in heart rate during the destruction of the central nucleus of the amygdala compared with the results of Sanders. In the journal *Brain Research*, an article by Zhang and co-authors (1986) describes studies on non-anesthetized, free-moving cats with bilateral cryogenic blockade of the central nucleus of the amygdala. In response to the stimulus during the non-cooling test, the heart rate was constantly decreasing. During cryogenic blockade of the central core, no significant effect of cooling on the heart rate was observed [12].

In a series of our studies, it was recorded that the heart rate is higher in rats that underwent central amygdectomy. Perhaps the data are so contradictory, due to the use of significantly different methods of switching off the central nucleus of the amygdala.

In our studies on female rats, when modeling a stress reaction, an increase in the parameters of the cardiovascular system (systolic pressure, diastolic pressure, pulse pressure and mean pressure) was noted by the third hour after administration of hydrocortisone in rats with a normally functioning amygdala and a decrease in the indicators in rats of the experimental group. These data correlate not only with the results of Sanders [10] and Kapp [11] studies, but also with the conclusions of researchers Zhang [12] and Galeno and co-authors. The latter, in an experiment on spontaneously hypertensive (SHR) and Wistar-Kyoto (WKY) rats with destroyed central amygdala nuclei, found an inhibition of the cardiovascular response to acute stress provoked by noise [13].

The influence of the central nucleus of the amygdala complex on the percentage ratio of various forms of leukocytes in the implementation of stress syndrome. Evaluating the ratio of leukocyte forms in the peripheral blood of experimental animals, statistically significant changes in the percentage of eosinophils were recorded during the stress reaction: a significant drop after the administration of hydrocortisone with the preservation of a low level of the parameter value for three hours of the experiment. In control females, there is a slight decrease in the number of eosinophils, however, the initial content of eosinophils at rest in the control group exceeds the values recorded by the third hour of the experiment. Similar data on the destructive effect of destabilization of regulatory mechanisms during the implementation of a stress response to the cardiovascular system, as well as destructive variation in the ratio of shaped blood elements were obtained by Yang X. with co-authors [14].

CONCLUSION

The results described in the article do not contradict and correspond to the data obtained by the researchers earlier in time, indicate the involvement of the central nucleus of the amygdala complex in the implementation of emotional and behavioral reactions and accompanying cardiovascular changes. And the assumption is that the predominant effect of the central nucleus of the amygdala on cardiovascular control lies on blood pressure, and not on the regulation of heart rhythm. Discrepancies in the results of studies with other authors are explained by the researchers' use of initially sick or genetically prone rats to cardiovascular diseases in experiments. Changes in the ratio of leukocyte forms recorded in the variation in the number of eosinophils: a drop and preservation of the level after 3 hours in the blood of centrally amygdalectomized female rats and a slight decrease in the number of eosinophils in intact rats show that in centrally amygdalectomized female rats, the stress reaction to hydrocortisone administration is more pronounced.

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使用聚乙烯醇和微晶纤维素提高食品涂层保护膜阻隔性能
**THE USE OF POLYVINYL ALCOHOL AND MICROCRYSTALLINE
CELLULOSE TO IMPROVE THE BARRIER PROPERTIES OF
PROTECTIVE FILMS OF FOOD COATINGS**

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抽象的。可食用薄膜(涂层)是从天然材料中获得的薄层,用于提高产品在运输、储存和销售过程中的质量。食品薄膜可以保护产品免受机械、化学和物理因素的影响,并减缓微生物腐败的过程。它们在食品工业中的使用可以通过多种因素来解释,例如成本、机械性能、光学性能、气体和蒸汽渗透性、以及对微生物的抵抗力以及感官特性的改善。

本文提出了基于聚乙烯醇和微晶纤维素的可生物降解聚合物涂层的选择,并添加了防腐剂和抗氧化剂,以延长鱼和鱼半成品的保质期。

关键词: 鱼、自溶、微生物、生物降解膜、聚乙烯醇、微晶纤维素、鉴定、细菌腐败。

Abstract. *Edible films (coatings) are thin layers obtained from natural materials that are used to improve the quality during transportation, storage and*

sale of the product. Food films protect products from mechanical, chemical and physical factors, as well as slow down the processes of microbiological spoilage. Their use in the food industry is explained by a number of factors such as cost, mechanical properties, optical properties, gas and vapor permeability, as well as resistance to microorganisms, and improvement in organoleptic characteristics.

This paper presents options for biodegradable polymer coatings based on polyvinyl alcohol and microcrystalline cellulose with the addition of preservatives and antioxidants to increase the shelf life of fish and fish semi-finished products.

Keywords: *fish, autolysis, microorganisms, biodegradable film, polyvinyl alcohol, microcrystalline cellulose, identification, bacterial spoilage.*

Goal of the work

Determination of possible markers for evaluating the extension of the shelf life of fish and fish semi-finished products using gas-liquid-chromatomass spectrometry, identifying applicants for safety and quality markers of fish and fish semi-finished products, in order to obtain safe composite compositions of biodegradable coatings based on polyvinyl alcohol, microcrystalline cellulose, during further research, with the addition of preservatives and antioxidants to increase the characteristics of the quality and safety of fish.

Materials and methods

Currently, one of the most promising areas in the food industry is the production of safe and effective biodegradable coatings based on natural polysaccharides or synthetic non-toxic materials. This paper describes a method for obtaining variants of biodegradable polymer coatings based on polyvinyl alcohol and microcrystalline cellulose.

Polyvinyl alcohol (PVA) is a synthetic, hydrophilic, heat-resistant polymer [1,2]. For further use in obtaining samples, it was obtained by the polymerization of polyvinyl acetate dissolved in methyl alcohol in the presence of alkali. Microcrystalline cellulose (MCC) is a mass used as a structure-forming agent, as well as an enterosorbent. A product of the chemical decomposition of cellulose, which is characterized by a high content of the ordered part of cellulose with a crystallographic orientation of macromolecules.

The study was carried out on two types of fish of different fat content Frozen hake TU 9261-002-51561792-005 and Frozen herring TU 10.20.13-002-51561792-2018.

Biodegradable coatings were obtained by applying on a substrate. At the same time, a molding solution of 4% PVA solution was obtained, which was transferred to an inert substrate, on which a solution of MCC was previously applied, which was obtained in the same way from a 3% aqueous solution of MCC, potassium sorbate, potassium ascorbate, salts of oxalic acid, then the solutions were dried by

blowing for 10-20 minutes. The solvent was evaporated from the PVA solution for 3–7 days at normal temperature under static conditions. Next, the film sample was separated from the substrate [3, 4, 5].

Results and discussion

To increase microbiological parameters and increase shelf life, potassium sorbate, potassium ascorbate, oxalic acid salts, which have activity against microorganisms, fungi and molds characteristic of fish, are added to the MCC solution.

Coating samples are applied to fish in two stages. At the first stage, an MCC film is formed, then a ready-made PVA solution with selected preservatives is applied. Both processes are carried out at a temperature of polymer solutions and fish surface not higher than 3 to 5 C.

It took 7 days to establish spoilage markers and their MPC in the selected fish samples. The markers were identified by gas-liquid chromatomass spectrometry. During the experiment, 12 markers were established, among them hexanoic, succinic acid were detected in the maximum concentration, which most fully reflect the spectrum of microorganisms controlled by SanPin 2.3.2.1078-01 and GOST 32366-2013 Frozen fish specifications. For this spectrum of microorganisms, the following variants of biodegradable polymer compositions based on PVA and MCC were selected.

1. PVA + MCC (control sample)
2. PVA + MCC + potassium sorbate
3. PVA + MCC + potassium ascorbate
4. PVA + MCC + oxalic acid salts

Figures 1 and 2 show samples of coatings obtained on the basis of polyvinyl alcohol and microcrystalline cellulose. The coatings shown in Figures 1 and 2 increase the shelf life by 2.2 times due to a decrease in the microbiological contamination of the samples.

The samples were placed under various storage conditions. The results are shown in Figure 1 and 2.

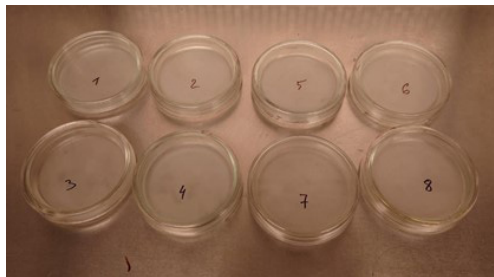


Figure 1. Samples laid down for storage

On the 15th day of storage, the microbiological pattern of the samples looked like in Fig. 2.

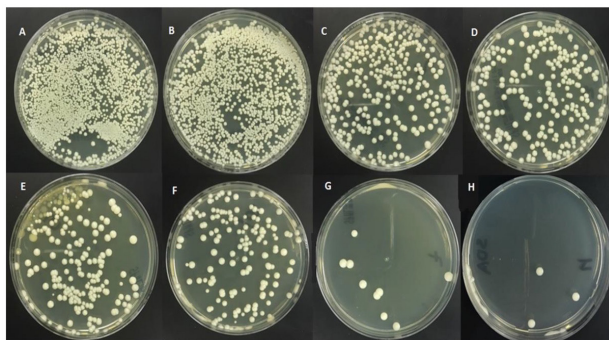


Figure 2. Seeding of composite samples on Petri dishes

Conclusions

In the present work, a study of spoilage of fish and fish semi-finished products was carried out by the method of gas-liquid-chromatomass spectrometry. According to the results of the study, 12 applicants for fish spoilage markers were identified, one of which tyramine according to GOST 32366-2013 p. 7.3 is a fish safety marker and is produced under the action of enzymes. In accordance with the found identifiers, 4 samples of biodegradable composite compositions of films were selected, in further studies their physical-mechanical, microbiological and toxicological characteristics will be studied.

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纳米级无涂层硅的性能和体内毒性测定
PROPERTIES AND *IN VIVO* TOXICITY ASSAY OF NANOSCALE UNCOATED SILICON

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抽象的。硅纳米粒子 (SiNP) 由于其独特的光学特性 (即强荧光和非常高的光稳定性), 在生物和生物医学应用 (包括生物成像) 方面非常有前景。据报道, SiNPs 的体外毒性较低或可忽略不计, 但 SiNPs 的体内毒性和生物效应仍不确定。通过超声处理将未涂覆的 SiNP 分散在水中, 观察到它们快速聚集 (粒径为 319.0 ± 2.4 nm)。使用斑马鱼胚胎和幼虫研究了体内毒性。观察到它们在培养介质中快速聚集; 除此之外, 25 mg/L 或更高浓度的 SiNPs 会导致鱼鳔畸形和/或死亡。7 天幼虫的估计 LC₅₀ 值为 180 mg/L。这是首次对未涂层和未功能化的 SiNP 进行体内毒性研究。为了在生物介质中获得更好的稳定性和更低的毒性, SiNPs 应该被亲水层覆盖, 但在这种情况下它们被细胞膜的吸收可能较弱。

关键词: 无涂层硅纳米颗粒; 聚合; 体内毒性; 斑马鱼幼虫的 LC₅₀。

Abstract. Silicon nanoscale particles (SiNPs) are highly promising for biological and biomedical applications, including bioimaging, due to their unique optical properties (i.e., strong fluorescence and very high photostability). Their low or negligible *in vitro* toxicity has been reported, but *in vivo* toxicity and biological effects of SiNPs are still uncertain. Uncoated SiNPs were dispersed in water via sonication, and their rapid aggregation was observed (319.0 ± 2.4 nm particle size). *In vivo* toxicity was studied using *Danio rerio* embryos and larvae. Rapid aggregation in their incubation medium was observed; besides that, SiNPs at 25 mg/L or higher concentration induced swim bladder malformation and/or death of the fish. The estimated LC₅₀ value for 7-day larvae was 180 mg/L.

This is the first in vivo toxicity study of uncoated and unfunctionalized SiNPs. To achieve better stability in biological media and lower toxicity, SiNPs should be covered with hydrophilic layers, but their absorption by cellular membranes may be weaker in this case.

Keywords: uncoated silicon nanoparticles; aggregation; in vivo toxicity; LC₅₀ for *Danio rerio* larvae.

Introduction

Cancer is one of the leading causes of premature death worldwide [1]. Tumor development can be prevented at early stages if it is diagnosed early enough. Various nanosized materials have been introduced into the molecular diagnostics of cancer recently [2]. Nanomaterials are promising agents for that due to their ultra-high surface-to-volume ratio which allows them to be stable and diffuse in aqueous biological media. The particles should be hydrophobic enough to be absorbed by cellular membranes and hydrophilic enough to be stable in ion-containing water.

Besides colloidal stability, nanomaterials should have some properties that would allow them to be used in tumor detection and characterization. If there are nanomaterials which can be used as contrast agents, fluorescence imaging would be helpful; fluorescence imaging is one of the most widespread methods of imaging in biological sciences [3].

Silicon (Si) nanoparticles (SiNPs) have been studied since late 1980s [4]. Currently, there are multiple industrial applications of SiNPs: luminescent display devices, semiconductors, solar energy cells, lithium batteries, etc [5]. It is possible due to their unique optical properties (i.e., strong fluorescence and very high photostability) [6]. A strong and stable fluorescence peak of SiNP suspension at about 600 nm (depending on particle size) has been reported [7,8]. This Si-Si bond peak lost only about 30% of its intensity after 4 days of incubation at room temperature [7]. Thus, SiNPs are highly promising for biological and biomedical applications, including bioimaging and, for example, specific targeting cervical cancer cells or glioblastoma cells [3]. Such optical properties were also discovered for semiconductor nanocrystal quantum dots (QDs) consisting of CdSe/ZnS or CdSe/CdS/ZnS layers; they were also called promising for cancer imaging [9]. The structure of these particles shows that they are potentially strongly toxic for living matter. *In vivo* toxicity of Cd-based QDs caused mainly by Cd²⁺ release after hydrolysis in biological media has been reported [10,11]. Cd²⁺ is a very toxic heavy metal cation; besides chelation of biomolecules, it has a unique mechanism of toxic action. It blocks Ca²⁺ membrane transport channels by binding to channel proteins, which is caused by very close ionic radii of Ca²⁺ and Cd²⁺ [12]. SiNPs are quite chemically inert and potentially much less toxic and, therefore, more suitable for biomedical applications.

SiNPs have been reported to be nontoxic *in vitro* [13]. The US Food and Drug Administration (FDA) has given approval for clinical trials to test SiNPs for food and medical applications [14], but there is a lack of *in vivo* toxicity data for SiNPs, especially for pure uncoated and unfunctionalized particles.

Materials and Methods

Chemicals

SiNPs were manufactured by Sigma-Aldrich, St. Louis, MO, USA. According to the manufacturer's datasheet, the reagent had 99.0% purity (oxygen content was up to 0.7% due to partial oxidation); the particles had spherical shape and 50 nm mean size.

Preparation and characterization of SiNP suspension

A stock 5 g/L suspension was prepared using the following technique. Two hundred and fifty milligrams of SiNP powder was weighed in a plastic glass, and 50 mL of 5× diluted reconstituted water (see Toxicity assay procedure subsection) was added. The mixture was shaken vigorously and sonicated three times in a Sonopuls HD 2200 ultrasonic homogenizer (Bandelin, Berlin, Germany) at 66% of power for 10 min in ice water with intermediate cooling for 5 min.

Particle size distribution was studied with N5 Submicron Particle Size Analyzer (Beckman Coulter, Brea, CA, USA) using 90° light scattering angle. The measurement was made in triplicate. The mean ± SD particle size value was calculated using the device software.

Animals for in vivo toxicity assay

Adult *Danio rerio* fish were held in aquaria in permanently filtrated and aerated reconstituted water (294 mg/L $\text{CaCl}_2 \cdot 2\text{H}_2\text{O}$ + 65 mg/L NaHCO_3 + 123 mg/L $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$ + 6 mg/L KCl in distilled water; 1 L of water per fish). The fish were fed with dry TetraMin Crisps flake feed (Tetra, Melle, Germany) twice a day + frozen brine shrimp (Aqua Logo, Moscow, Russia) once a day. Forty per cent of aquarium water was changed to newly prepared reconstituted water every 2 weeks. The water temperature was kept at 26 ± 1 °C. The aquaria were lit for 14 h per day. The fish maintenance procedure is described in detail in OECD guidelines [15].

A week before the experiment, 2 mature female fish were isolated in a special aquarium with the same conditions. The fish were fed 24 h before spawning, and the next feeding was only after spawning. After the last feeding, 5 mature males were moved into the aquarium with the isolated females. The aquarium bottom was covered by a plastic net with about 1.5 mm mesh size to prevent eating of eggs by the fish. Next morning the spawning occurred, the fish were moved back to basic aquaria, and the eggs were collected. The healthy fertilized eggs were selected at the 16–32-cell blastula stage (1.5–2 h post-fertilization) using EZ4 D stereo microscope (Leica Microsystems, Wetzlar, Germany).

Toxicity assay procedure

Suspensions for incubation were prepared in wells of 24-well sterile microtiter plates (2 ml per plate) via dilution of the stock 5 g/L suspension by preliminarily aerated mixture of reconstituted water (see the previous subsection) and distilled water (1:4 volume ratio). The composition of reconstituted water is optimized for freshwater fish and recommended by OECD [15] for toxicity testing. Despite that, the use of 5× diluted reconstituted water also does not make any adverse effects on fish embryos and larvae but significantly increases stability of suspensions of nanoparticles, according to our previous experience [16]. The selected eggs were placed into wells with the following SiNP suspensions: 0 (control), 10, 25, 50, 100, 250, and 500 mg/L, n = 24 eggs (1 plate) per each suspension. The classic static test was performed: the animals were incubated in the suspensions for 7 days at 26 ± 0.1 °C without medium replacement. Each 24 h, the suspensions and the embryos/larvae were observed using the Leica EZ4 D microscope with built-in digital camera; any visible adverse effects including death were recorded. The assay was made in triplicate. The data were analyzed using STATISTICA 9.0 software. The toxicity assay procedure is described in detail in OECD guidelines [15].

Ethical Approval

This study has been approved by the Ethics Committee of the Institute of Biomedical Chemistry. The protocol of the study is guided by the Directive 2010/63/EU “On the protection of animals used in the laboratory research”.

Results and Discussion

Particle size distribution of the stock SiNP suspension

The distribution is shown in Figure 1. The calculated particle size was 319.0 ± 2.4 nm. Despite intensive sonication, SiNPs aggregated immediately in aqueous medium (5× diluted reconstituted water) due to their hydrophobic nature (the mean initial size was 50 nm).

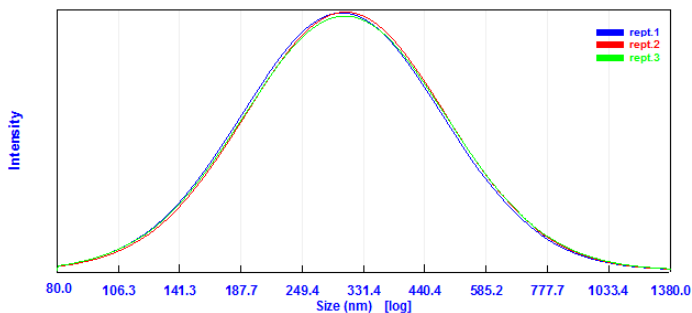


Figure 1. Particle size distribution of stock 5 g/L silicon nanoparticle (SiNP) suspension right after its preparation

In vivo toxicity of SiNPs

Noticeable extent of aggregation and sedimentation of Si particles was observed even after 24 h of *Danio rerio* embryo incubation in every SiNP suspension (see Figure 2). Despite possible interference in diffusion of oxygen and metabolites through pores of the embryo chorion by the sediment, there was no statistically significant toxicity at the embryo stage (including hatching rate and time).

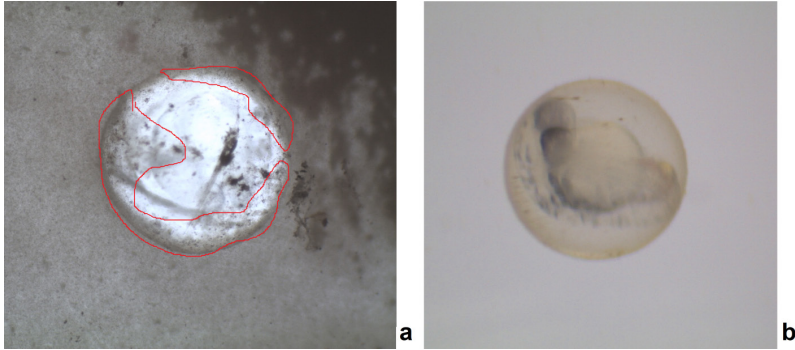


Figure 2. (a) a *Danio rerio* embryo covered with Si sediment after 24 h of incubation in 250 mg/L SiNP suspension, 35 × magnification. Areas of the chorion, mostly covered with sediment are contoured with red. (b) a healthy 24-h old embryo (control), 35 × magnification.

At the larval stage (5–7 d of incubation), cases of void swim bladders and fish death were observed; the rate of these toxic effects was statistically significant (see Table 1). However, there were no typical severe toxic effects, i.e., edema, tail curvature, etc. A possible cause of swim bladder malformation was the influence of heavy hydrophobic Si sediment (2.33 g/cm³ density, according to the manufacturer’s datasheet) from the bottom of plate well (see Figure 3), so it was hard for a larva to swim up and swallow some air.

Table 1

Cumulative toxic effects of SiNPs at Danio rerio larvae after 7 days of incubation. The survival rate in control was $91.7 \pm 4.2\%$; all swim bladders were normal in control.

Concentration of SiNPs (mg/L)	Survival rate (ratio to that in control)		Void swim bladder percentage among survivors	
	Mean \pm SD	ANOVA* between test and control groups	Mean \pm SD [%]	ANOVA between test and control groups
10	100 \pm 0.0	-	0.0 \pm 0.0	-
25	100 \pm 0.0	-	20.8 \pm 8.4	P < 0.05
50	100 \pm 0.0	-	41.7 \pm 8.4	P < 0.01
100	74.5 \pm 7.9	P < 0.05	50.0 \pm 12.6	P < 0.01
250	38.6 \pm 8.3	P < 0.05	100 \pm 0.0	P < 0.01
500	0.0 \pm 0.0	P < 0.01	- [no survivors]	-

*Analysis of variance.

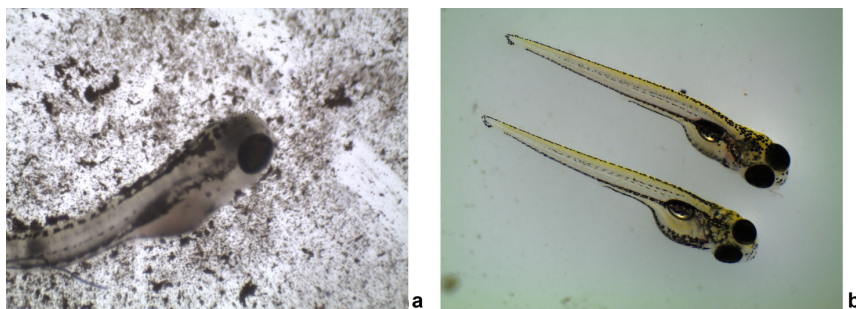


Figure 3. (a) a *Danio rerio* larva with void swim bladder after 7 days of incubation in 25 mg/L SiNP suspension, 35 \times magnification. (b) healthy 7-day-old larvae with filled swim bladders (control), 30 \times magnification.

LC₅₀ for 7-day larvae was 180 mg/L, the value was estimated graphically (see Figure 4).

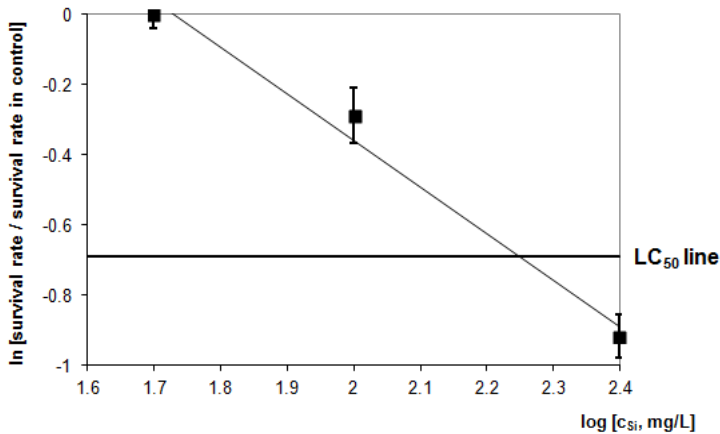


Figure 4. Graphical determination of LC_{50} of SiNPs for 7-day *Danio rerio* larvae. The value was calculated as $10^{[X\text{-coordinate of intersection point of logarithmic linear regression line of survival rate (in the form of ratio to that in control) vs. concentration and logarithmic } LC_{50} \text{ line}]}$. The error bars represent the standard deviation of determination for 24 larvae per each concentration (including control); the assay was made in triplicate ($n = 504$).

Discussion

Despite noticeable aggregation and sedimentation, SiNPs appeared to be significantly toxic *in vivo*. The acting concentration of SiNPs at the point of 50% death of larvae was even quite lower than the estimated LC_{50} value. The most likely cause of death of larvae was mechanical damage of cellular structures/compartments due to crystalline and hydrophobic nature of SiNPs. On the contrary, no *in vivo* toxicity of SiNPs was reported in the previous studies. It is necessary to consider that *in vivo* toxicity studies of only firmly coated SiNPs have been reported. Thus, intravenous injection of PEGylated micelles containing SiNPs (380 mg/kg) did not induce any toxic effects in mice [17]; carbohydrate-coated SiNPs were found to have no significant toxicity for *Xenopus laevis* frog embryos at 1000 mg/L [18]. In those studies, the coatings were quite hydrophilic and made the suspensions stable, but they were polymeric and chemically stable, so it is reasonable to consider that Si itself did not interact with living matter. Intravenous injection of SiNPs functionalized with less firm non-polymeric structure ($H_2NC_3H_6^-$) induced significant level of hemocyte apoptosis in *Bombyx mori* silkworm larvae at dosage of 3.9 μg of Si per animal [19]. Our study is the first *in vivo* toxicity study of uncoated and unfunctionalized SiNPs, and the toxicity was found significant too.

To achieve better stability in biological media and lower toxicity, SiNPs should be covered with hydrophilic layers, but their absorption by cellular membranes may be weaker in this case. If the particles are used for cellular bioimaging, they should be hydrophobic enough to be absorbed by cellular membranes. The use of uncoated SiNPs for bioimaging applications appears to be questionable due to their significant *in vivo* toxicity. Perhaps it is reasonable to use other chemically inert hydrophobic nanoparticles; for example, gold nanoparticles (AuNPs) have weaker fluorescence than SiNPs do, but toxicity of AuNPs is truly negligible [16,20].

Conclusions

Rapid aggregation of SiNPs in aqueous medium was observed (319.0 ± 2.4 nm particle size). SiNPs induced swim bladder malformation and/or death of fish embryos and larvae. The estimated LC_{50} value for 7-day *Danio rerio* larvae was 180 mg/L. The use of uncoated SiNPs for bioimaging applications appears to be questionable due to their significant *in vivo* toxicity. This is the first *in vivo* toxicity study of uncoated and unfunctionalized SiNPs.

Conflicts of Interest: The authors declare that there is no conflict of interest regarding the publication of this paper.

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图上的 NP 完全问题和枚举方法
**NP-COMPLETE PROBLEMS AND ENUMERATION METHODS ON
GRAPHS**

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Doctor of Technical Sciences, leading specialist

Institute for Networking Technology

抽象的。 本文的目的是宣布图表示和图表示的枚举方法：转置法和节点图法。 本出版物介绍了作者在降低 NP 完全问题类的严重性方面所做工作的基本结果。

关键词：图、路径、哈密顿路径、枚举问题。

Abstract. *The purpose of the article is to announce graphs presentation and the enumeration methods on graphs presentations: the transposition method and the node-graph method. This publication presents the basic results of the author's work on reducing the severity of the NP-complete problem class.*

Keywords: *graph, path, Hamiltonian path, enumeration problem.*

Introduction

Humans have always strived for total knowledge, and as accurate as possible. The natural method of constructing accurate knowledge is a total enumeration of links between available autonomous facts. However, the modern approach considers full enumeration inefficient, but doesn't answer the question set in [1] - "can full enumeration be eliminated when solving discrete tasks"? Even though "approximate" methods vary [2], they have a few common features:

- there are no ε -approximate polynomial algorithms for some problems in discrete mathematics [3];

- they do not give facts, instead offering some probable results and, even given small deviations [2], give knowledge that can be relied upon only with caution.

At the present moment, requirements for algorithms for specific problems of discrete mathematics are changing. This is dictated by an urgent need to increase calculation accuracy in technology-related problems brought about by rapid digitization and virtualization, which actively permeated various scientific areas and changes the approach to previously studied objects. These objects include n -dimensional structures, known as circular structures, that describe global process-

es occurring in communication networks, multi-processor systems, in collective communications, stock market structures etc. Given that, both the development of new mathematical methods of solving problems and the solution of related calculation problems are deemed important.

The enumeration method, based on various modifications of systematic viewing (traversal) of graph elements and labeling, has been widely used and quite fully developed for a long time. Even though this method is very appealing, thanks to its simplicity, it likely doesn't pose much theoretical significance due to its low and non-current prominence in scientific literature [2-3]. Another method - the successive matrix multiplication method - has not received such prominence [4]. Given that modern advances in creating new methods have been quite meager, the author has focused on developing and researching the aforementioned methods and the possibility of compressing the factorial range of enumeration results while preserving its qualitative properties: versatility, comprehensiveness and accuracy. The author defines "compression" as conversion of enumeration results into some mathematical object.

The developed enumeration methods are showcased on the problem of listing Hamiltonian paths in a graph. The solution list problem (determining the numbers in the enumerated set) has been chosen for a few reasons:

- Solving the enumeration problem helps solve both the existence and optimization problems;
- Even if it's assumed that there is a method to recognize the Hamiltonian-ness of a graph and $P = NP$, it's not certain that the enumeration problem will be similarly "easy".

In the materials, a path means a sequence of arcs where the end vertex of any arc, unlike the last one, is the starting vertex for the next one [4]. In other words, a path is a sequence of adjacent vertices. A simple path is a path in which vertices are not repeated. Since only simple paths are being considered here, simple paths will be called just "paths" here and throughout the paper for the sake of brevity. The length of a path is the number of arcs forming it. The end result of enumeration is the number of Hamiltonian paths. A Hamiltonian path is a simple path containing all vertices of a graph.

The problem of enumeration of Hamiltonian paths is defined as follows: a graph $G[V, E]$ is given. What is the m power of the Hamiltonian path set, meaning how many of them are in a graph.

1 TRANSPOSITION METHOD

1.1 Graph presentation

A graph $G[V, E]$ is given, $v = |V|$ is the power of the set V . Let's present the given graph as an arc matrix V with the size of $v \times v$. Elements of the matrix V are linked with the following relationships:

$$v_{ij} = \begin{cases} i, j - \text{if } E(G) \text{ exist path } (ij) \text{ и } \exists i \in V, i \text{ и } j \in V(G) \\ 0 - \text{another} \end{cases}$$

In the matrix V , a comma is used to separate the values defining adjacent vertices.

The matrix V for a full graph of five vertices without loops looks like this:

		j				
		1	2	3	4	5
i	1	0	1,2	1,3	0	0
	2	0	0	2,3	2,4	2,5
	3	0	3,2	0	3,4	0
	4	0	0	4,3	0	4,5
	5	5,1	0	0	0	0

Elements v_{ij} of the matrix V show if there is a positively aimed arc (ij) from vertex i into vertex j . Since the state of each graph element is associated with the concept of incidence and adjacency, then i (row number) shows which vertex can be used to enter (input or source) into an element of the matrix V , and j (column number) shows which vertex can be used to exit it (output or sink).

1.2 Enumeration of paths in a graph

Enumeration of paths in graph $G[V, E]$ set by matrix V is done via forming tables of paths A^p with the size of $u \times v$, where u is the number of rows in table A^p . The element a_j^p of table A^p is a sequence of vertices, a path with the length of $p, p = 1, (v - 1)$. The set of tables forms the enumeration map.

The element a_j^p is formed by supplying the output j of element a_j^{p-1} to input i of element v_{ij} , meaning when $j = i$. The following is a process of path table formation using the matrix transposition operation and operations on graphs - adding a vertex. Adding a vertex allows a transition from a path of length p to a path of length $p = p + 1$.

A possible algorithm for enumerating all graph paths using the transposition method is shown below. The algorithm is described as a step-by-step procedure and ends after $p = 1, (v - 1)$ iterations by recording the power of Hamiltonian path set m .

Let's assume that the graph is set by the arc matrix V .

Step 1. $p = 1, m = 0, A^p = V$, elements of table A^p are sorted: null elements are replaced with values from the top down in the column. Rows that only contain null elements are deleted. The remaining rows are numbered from the top down, $u = \max i$. Go to step 2.
1,2,...

Step 2. Put $p = p + 1$, $q = 0$ and go to step 3.

Step 3. Put $q = q + 1$. For $j = \overline{1, v}$, the element c_{ij} of the transfer table-row C of size $1 \times v$ is defined as follows: $c_{ij} = a_{ij}^{p-1}$. Go to step 4.

Step 4. Each element b_j^q of intermediate table B^q of size $v \times v$ is defined as follows: if $j \neq i \wedge c_{ij}^T \neq 0 \wedge v_j \neq 0 \wedge j \notin c_{ij}^T$, then $b_j^q = c_{ij}^T + j$, where $+$ is the addition operation of the graph vertex, otherwise $b_j^q = 0$. If $p = (v - 1) \wedge b_j^q \neq 0$, then $m = m + 1$. Go to step 5.

Step 5. If $q = u$, then go to step 6, otherwise go to step 3.

Step 6. If $p = v - 1$, record m (answer) and go to step 8, otherwise go to step 7.

Step 7. Create table $A^p = \begin{matrix} & 1 \\ \dots & \dots \end{matrix}$ by composing tables B^q vertically, sort elements of table A^p , $u = \max i$. Go to step 2.

Step 8. End. 1,2,...

The presented algorithm implements the enumeration strategy “from” all vertices i “to” all vertices j . The transposition method also allows implementing all the other strategies.

The volume of enumeration (intermediate results and answer) while solving the problem of enumerating Hamiltonian paths in a graph does not exceed $ev!$, $e = 2,71828..$ - Euler number.

2 THE NODE-GRAPH METHOD

2.1 Graph presentation

The graph $G[V, E]$ is described with a set v of objects, called a «node-graph». Each node-graph looks like this:

$$\begin{matrix} [y] \\ [S] \end{matrix} U \begin{matrix} [w] \\ [T] \end{matrix},$$

where U is the body of the node-graph, the sequence of adjacent vertices (path) $U \subset V$, $u = |U|$ is the power of set U . Assume that the path from some vertex into itself always exists, and is of length $p = 0$. Then, to present the graph using node-graphs, take $U = k$, where $k = \overline{1, v}$ is the number of the graph vertex.

S is the input of the node-graph, an unlinked subset of vertices $S \subset V$, $s = |S|$ is the power of set S . Each vertex out of S only has an outgoing arc to the vertex out of U , $S \not\subset U$. The input of the node-graph is placed to the left of the body.

T is the output of the node-graph, an unlinked subset of vertices $T \subset V$, $t = |T|$ is the power of set T . Each vertex from T only has an incoming arc from the vertex into U , $T \not\subset U$. The output is placed to the right of the body.

y, w are the process parameters of the node-graph that characterize the object, for example, the number of elements in a node-graph, weight etc. Let us assume

that y is the number of paths going through the body U , while $w = p$.

Then the symbolic representation of the graph $G[V, E]$ shown on matrix V is the following sorted set of node-graphs:

$$c_{1j} \begin{matrix} j & 1 & 2 & 3 & 4 & 5 \\ \begin{bmatrix} 2 \\ 5 \end{bmatrix} 1 \begin{bmatrix} 2 \\ 2;3 \end{bmatrix} & \begin{bmatrix} 5 \\ 1;3 \end{bmatrix} 2 \begin{bmatrix} 2 \\ 3;4;5 \end{bmatrix} & \begin{bmatrix} 4 \\ 1;2;4 \end{bmatrix} 3 \begin{bmatrix} 2 \\ 2;4 \end{bmatrix} & \begin{bmatrix} 3 \\ 2;3 \end{bmatrix} 4 \begin{bmatrix} 2 \\ 3;5 \end{bmatrix} & \begin{bmatrix} 2 \\ 2;4 \end{bmatrix} 5 \begin{bmatrix} 2 \\ 1 \end{bmatrix} \end{matrix}$$

The semicolon is used to separate the numbers representing vertices that do not have an adjacency property in the subset. Node-graphs represent $G[V, E]$ as a combination of paths of length $p = 2$ through each vertex of the graph. Meaning, each of v node-graphs can compress (concentrate) $y \leq (v - 1) \times (v - 2)$ paths, since no more than $(v - 2)$ outputs exist for $(v - 1)$ inputs of each vertex. Moreover, no complicated procedure is required to obtain such a representation. It's not difficult to calculate that in such a presentation, the input size of the problem is substantially smaller than when the graph is presented in other ways.

2.2 Operation on node-graphs

The presented materials use the operations of vertex and arc addition (deletion) to (from) the body of the node-graph.

Addition of vertex i (j) into the body from input $S \neq \emptyset$ (output $T \neq \emptyset$) is performed as follows:

- Adding this vertex to the set of vertices of body $U = i + U$ ($U = U + j$) while preserving all arcs of the graph, $i \in S, j \in T$;
- Substituting inputs (outputs) S (T) for outputs (inputs) of node-graph i (j) in the initial presentation;
- Deleting vertices i (j) belonging to U , together with their incidental arcs, from S (T).

2.3 Enumeration of paths in a graph

The enumeration process using the node-graph method consists of regulated addition of a vertex from the input (output) into the body of the node-graph. Regulation algorithms may vary, but the author presents the following algorithm.

Let us assume that graph $G[V, E]$ is defined by a sorted combination v of node-graphs.

Step 1. $p = 2, m = 0$. If $p = v - 1$, then $m = m + \sum y$ and go to step 8, otherwise go to step 2.

Step 2. If $v = 2n + 1 | n \in N$, then $r = v$ and go to step 6, otherwise go to step 3.

Step 3. $q = \overline{1, r}, j = \overline{1, t}, j \in T$ for $\forall c_{1j}$, if $T \neq \emptyset$, create table-rows D , enter $d_{jq} = c_{1q}$ into each cell of the table. Number the table columns after each vertex of the output. Go to step 4.

Step 4. $p = p + 1, q = \overline{1, r}, j = \overline{1, t}$. For $\forall d_{jq} \neq 0$, add the vertex to the

body of the node-graph from output $U = U + j$, where j is the table column number. If $= \emptyset \vee (= = 1 \wedge =)$, the node-graph is deleted. If $p = v - 1$, then $m = m + \sum y$ and go to step 8, otherwise go to step 5.

Step 5. $r = 0$. Create table $C = \begin{matrix} d_{1j} \\ \dots \\ d_j \end{matrix}$ of size $(v-1) \times (v-1)$ by composing

tables D vertically, for $i = \overline{1, v}$, $j = \overline{1, t}$ sort elements of table C , if $c_j \neq 0$, then $r = r + 1$ and go to step 6.

Step 6. For $\forall c_j$, create tables D^q of size $s \times t$, $q = \overline{1, r}$. Number the table rows after each vertex of the input. Number the table columns after each vertex of the output. If $i \neq j$, enter one element from table $d_j^q = c_j$ into each table cell. Go to step 7.

Step 7. $p = p + 2$. For $\forall d_j^q$, if $d_j^q \neq 0$, add the vertex into the body of each node-graph from input and output $U = i + U + j$, where i is the table row number, j is the table column number. If $S = \emptyset \vee T = \emptyset \vee (s = t = 1 \wedge S = T)$ the node-graph is deleted. If $p = v - 1$, then $m = m + \sum y$ and go to step 8, otherwise go to step 5.

Step 8. End.

The node-graph method, like the transposition method, works properly on an arbitrary graph and allows for searching of paths not only “from” and “into”, but also “through” the graph vertex.

The volume of enumeration (intermediate results and answer) while solving the problem of enumerating Hamiltonian paths in a graph does not exceed $eSv!$, $S = 0,187859\dots$ – constant MRB.

Conclusion

The following conclusions were made:

1. Modern government and enterprise control systems, communication and automation networks, information and power supply systems, transport systems are characterized by a vast territorial reach, a huge number of objects, high-intensity streams (of information, energy, cargo etc.), a complex connection structure and unpredictable quality of resources. Accurate analysis and optimization of operation of distributed systems is a very complex problem, which the discrete mathematics apparatus currently has no solutions for. Usually, the graph theory apparatus is used to describe and analyze such systems in the most convenient way.
2. A graph is the only mathematical object combining the structural and flow content of discrete mathematical problems. As a consequence, it's exceptionally popular in science fields related to network structures.

3. Any enumeration method on a graph is a theoretical base for development of algorithms, for both optimization and existence problems.
4. A new presentation of a mathematical object usually also defines new forms of processing of such objects. This means that if there is a goal to develop a new mathematical method, including one that solves calculation problems, first of all, it's necessary to try to change the presentation form of the mathematical object - in our case, a graph.
5. A new presentation form also defines new procedures (operations) and its own specific set of algorithms for working with graphs. This means that the possibility of using a specific method for various discrete mathematical problems is equally defined by the graph presentation quality and the set of operations and variety of options for their applications.
6. A graph can be presented as a graphic, as an arc matrix, as a set of node-graphs and in a multitude of other ways. All of them are equivalent, since any graph presentation can be obtained from another one.
7. As the results show, graph presentation using a set of node-graphs is the most compact option. As a consequence, it's possible to compress enumeration results while preserving its qualitative properties: versatility, comprehensiveness and accuracy.

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利用可再生能源产生冷气

GENERATION OF COLD WITH RENEWABLE ENERGY

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注解。 文章介绍了利用河道和海浪的可再生水力能进行发电的气动发电机的原理图以及获取冷量的方法。 利用气动能产生冷量是通过滴落液体使气泡柱中的空气膨胀来进行的,然后将冷却的空气发送给消费者。

关键词: 溪流和海浪的水力能、气动能、空气的气泡膨胀、冷能。

Annotation. *The article describes the schematic diagrams of pneumatic power generators that use renewable hydraulic energy of watercourses and sea waves for generation, as well as a method for obtaining cold. The production of cold from pneumatic energy is carried out by expanding the air in bubble columns with dropping liquid, after which the cooled air is sent to consumers.*

Keywords: *hydraulic energy of streams and sea waves, pneumatic energy, bubbling expansion of air, cold energy.*

Introduction

Pneumatic energy in a number of industries and construction is necessary for the implementation of various technological processes. For example, it is used in air conditioning systems, in drainage systems for aerating wastewater and for driving various mechanisms. When receiving pneumatic energy, air blowers are used, driven, as a rule, by electric motors. For the production of electricity, in most cases, hydrocarbon raw materials are used, which leads to an increase in the “carbon footprint” in the atmosphere, creates a greenhouse effect and contributes to an increase in temperature on the planet. The article proposes environmentally friendly ways to generate pneumatic energy to produce cold.

Technologies and designs

The use of renewable hydraulic energy from watercourses and sea waves will eliminate the negative effects of pneumatic power production. The hydraulic energy of watercourses is currently removed, as a rule, with the help of hydro turbines [1-5]. Consider the traditional use of the hydraulic energy of watercourses to generate electrical energy using hydraulic turbines with its subsequent conversion into useful pneumatic power. The transformation chain consists of several steps. The first stage is the conversion of the hydraulic energy of the watercourses into the mechanical power of the turbine's rotation. The next step is the conversion of the mechanical energy of the turbine rotation into electrical power using an electric generator. Then, the electric energy drives the electric motor, which rotates the shaft of the blower equipment, followed by the production of pneumatic energy.

This scheme for converting hydraulic energy into useful pneumatic power has a fairly large number of intermediate conversion stages and is characterized by energy loss at each intermediate stage. Consideration of the issue of direct conversion of the hydraulic energy of watercourses into useful pneumatic power, bypassing many intermediate stages of energy transformation, deserves attention. To do this, you can use the principle of operation of known hydraulic rams [6-11], modifying them. Traditional hydraulic rams are water-lifting devices. A diagram of a modified hydraulic ram equipped with membrane compressors for generating pneumatic energy is shown in fig. 1.

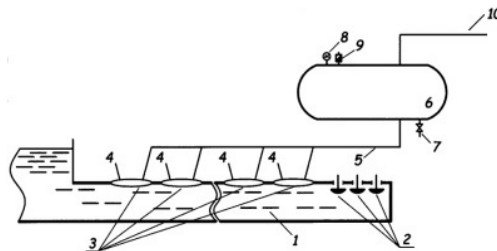


Figure 1. Scheme of a modified hydraulic ram. 1 - pressure pipeline; 2 - shock valves; 3 - air membrane compressors; 4- suction pipe of the membrane compressor; 5 - pressure pipe of the membrane compressor; 6 - air receiver; 7 - condensate discharge; 8 - manometer; 9 - overpressure relief valve; 10 - compressed air consumer pipeline.

At the Tyumen Industrial University, a modified hydraulic ram installation was created, shown in Fig. 2,3 [12,13].

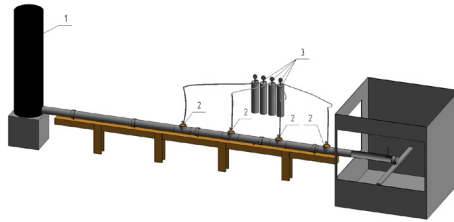


Figure 2. Computer model of the experimental hydraulic ram. 1 - pressure pipeline; 2 - air membrane compressors; 3 - receivers with pressure gauges.



Figure 3. Photo of an experimental modified hydroram.

Membrane compressors, driven by intermittent water hammer energy, generate pneumatic energy for cooling. Another form of renewable hydraulic energy is sea wave energy. A device that makes it possible to use the renewable energy of sea waves for the joint generation of pneumatic energy to produce cold and high pressure hydraulic energy to power reverse osmosis desalination plants is shown in fig. 4.5.

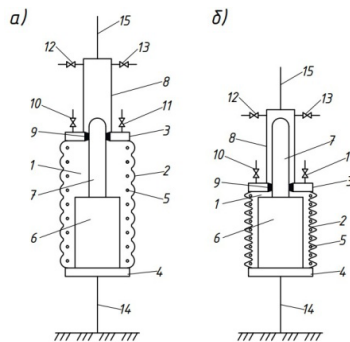


Figure 4. Scheme of a bellows pump-compressor for the joint generation of pneumatic energy to produce cold and hydraulic energy of high pressure sea water to power reverse osmosis desalination plants.

- Figure 4 shows the following positions:
- 1 - working chamber;
 - 2 - bellows elements made of elastic material;
 - 3 - movable wall of the working chamber;
 - 4 - fixed bottom of the working chamber;
 - 5 - stiffening rings;
 - 6 - solid or liquid cylinder, which is the piston of the air compressor and reduces the formation of dead volume in the working chamber of the compressor;
 - 7 - plunger of the high pressure water pump;
 - 8 - high pressure water pump housing;
 - 9 - sealing of the plunger of the high pressure water pump;
 - 10 - suction valve of the air compressor;
 - 11 - discharge valve of the air compressor;
 - 12 - suction valve of the high pressure water pump;
 - 13 - discharge valve of the high pressure water pump;
 - 14 - cable connecting the fixed bottom of the working chamber with the bottom of the sea area;
 - 15 - a cable connecting the water pump housing with a floating buoy that removes the energy of sea waves.



Figure 5. Photo of a bellows generator of pneumatic energy to produce cold and high pressure hydraulic energy to power reverse osmosis desalination plants.

The operation of the pneumatic energy generator is carried out as follows. On Fig. 4 shows the listed arrangement of the functional elements of the pump-compressor when the device is located under the level of the water area. Under the letter (a) shows the location of the elements of the device when the buoy with positive buoyancy, connected to the water pump housing by a cable (15), is on the crest of a sea wave. The bellows in this case are stretched due to the buoyancy force of the water acting on the floating buoy (air and water intake stroke). Under the letter (c) shows the location of the elements of the device when the buoy with positive buoyancy, connected to the cable (15), is in the hollow of the sea wave. The compression of the bellows in this case is carried out due to the hydrostatic

water pressure at the installation site of the working chamber (water and air injection cycle). The bellows pump-compressor contains a working chamber (1) formed by interconnected bellows elements made of elastic material (2), closed on one side by a movable wall (3), and on the other side by a fixed bottom (4). Bellows elements made of elastic material (2) are provided with stiffening rings (5) to prevent deformation of the bellows elements under the action of hydrostatic water pressure at the installation depth of the working chamber (1). Bellows elements (2) are made of elastic material. A solid cylinder (6) is attached to the fixed bottom (4) inside the working chamber, which is a compressor piston and reduces the formation of dead volume (harmful space) in the working chamber (1) when air is compressed. Alternatively, as a piston, it is possible to use a drop incompressible liquid poured into the working chamber. A water pump plunger (7) is attached to the cylinder (6), which is included in the water pump body (8) attached to the movable wall of the working chamber (3). The movable wall of the working chamber (3) has a seal (9) for the water pump plunger (7). The suction (10) and discharge (11) valves of the air compressor are located on the movable wall (3) of the working chamber (1). The suction (12) and discharge (13) valves of the water pump are located on the housing (8) of the water pump. The fixed bottom (4) of the working chamber (1) is fixed to the bottom of the sea with a cable (14). The housing (8) of the water pump is connected to the floating buoy, which removes the energy of sea waves, by a cable (15). Pneumatic energy obtained on a modified hydraulic ram installation or with the help of a bellows pump-compressor is fed through a pipeline through a heat exchanger, in which the air is cooled to ambient temperature, to the installation for obtaining cold. The plant consists of several heat-insulated bubbling columns filled with liquid antifreeze and connected by heat-insulated air ducts. Good thermal insulation of the bubble columns and air ducts is necessary to ensure that the air in bubble columns with liquid antifreeze expands without heat exchange with the environment. Compressed air from the pneumatic energy generators through the pre-cooling heat exchanger is fed into the lower part of the first bubble column with liquid antifreeze. The total number and height of the bubble columns are chosen taking into account the initial overpressure of compressed air supplied to the bottom of the first liquid antifreeze bubble column. The greater the initial excess air pressure, the greater should be the total hydrostatic pressure of the liquid antifreeze columns in the bubble columns. Bubbles of compressed air, floating up in a liquid heat-insulated antifreeze, do work to overcome the forces of hydrostatic pressure of liquid antifreeze columns, expand and cool. Air is passed sequentially through all columns of liquid thermally insulated antifreeze until it is completely expanded and cooled at atmospheric pressure in the upper part of the last column of thermally insulated liquid antifreeze. The freezing point of liquid antifreeze is lowered sequentially from the first to the last column of liquid anti-

freeze as the air expands and cools. Completely cooled air is taken for supply to the consumer.

On Fig. 6. shows a general view of the device.

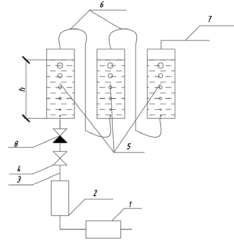


Figure 6. Scheme of installation for obtaining cold.

Figure 6 shows the following positions:

1 - pneumatic energy generator (modified hydraulic ram or bellows pump-compressor);

2 – heat exchanger for preliminary cooling of compressed air;

3 - air duct supplying pre-cooled compressed air;

4 - regulator of pressure and flow of pre-cooled compressed air;

5 - heat-insulated liquid antifreeze with different freezing temperatures;

6 - heat-insulated air ducts connecting the columns of liquid antifreeze;

7 - air duct supplying air cooled to negative temperatures to the consumer;

8 - check valve to prevent liquid antifreeze from entering the supply air duct.

The production of cold by expanding air in a bubble column was modeled at the Tyumen Industrial University on an experimental setup shown in Fig. 7.



Figure 7. Photos of a model experimental installation for obtaining cold with an intermediate heat exchanger.

Without an intermediate heat exchanger, it is not possible to achieve a decrease in the temperature in the bubble column below the environment. This requires an

intermediate heat exchanger, which was used as a flexible air duct lowered into the water. Water from the water area of the intermediate refrigerator with a temperature of 9 degrees Celsius was used as a dropping liquid with a height of one meter in the bubble column. In the experimental setup, pneumatic energy was generated by a blower. The excess pressure created by the blower at the inlet to the bubble column is 10,000 Pa. The air temperature at the inlet to the bubble column after the intermediate cooler is 10 degrees Celsius. According to the results of a theoretical calculation using known formulas [14], the temperature of the adiabatic expansion of air to atmospheric pressure at the given experimental parameters should be -2.4 degrees Celsius.

Results

It was not possible to achieve the theoretical value of the temperature of the adiabatic expansion of air in the bubble column during the experiment on a model installation. In the process of bubbling air in the column, the temperature of water and air at the outlet of the bubbling column gradually dropped, reaching -5 degrees Celsius. The difference in the values of the theoretical and experimental air temperatures during its expansion to atmospheric pressure at given initial parameters indicates that in the experiment there was a polytropic expansion of air with heat supply, due to insufficient thermal insulation of the bubble column.

Conclusions

Despite the difference between the calculated and experimental values of the temperature of the cooled air, due to insufficient thermal insulation of the experimental model installation, the experiment confirms that when using free pneumatic energy obtained from renewable sources, cold can be generated by expanding air in bubble columns. Bubble columns are much simpler and cheaper than the turbo-expander units used today for these purposes. In addition, the use of renewable hydraulic power to generate pneumatic power, followed by cold production by bubbling air into the droplet, reduces the carbon footprint of the atmosphere.

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适用于生产、勘探、搜索和注入井的流程优化软件

PROCESS OPTIMIZATION SOFTWARE FOR PRODUCTION, EXPLORATION, SEARCH AND INJECTION WELLS

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抽象的。 本文讨论了允许使用水力模型来优化和自动化工程计算的软件, 这将消除错误。 阐述了软件包的工作原理、主要参数、功能和模块。 显示计算结果。 描述了将软件引入生产的策略。 事实证明, 使用该软件将提高采矿工程师的工作效率。 该软件产品作为应用程序很容易使用。

关键词: 软件、分析、工程计算、水力模型、接口。

Abstract. *This paper discusses software that allows using hydraulic models to optimize and automate engineering calculations, which will eliminate errors. The principles of operation of the software package, its main parameters, functions and modules are described. The calculation results are shown. The strategy of introducing software into production is described. It is shown that the use of this software will improve the efficiency of the mining engineer. The software product is easy to use as an application.*

Keywords: *software, analysis, engineering calculation, hydraulic model, interface.*

Introduction

During the construction of wells of different categories, a field drilling engineer is faced with the problems of engineering calculations on site.

And when minutes are counting, it is very important to quickly and accurately make decisions on further actions in order to avoid complications during the well construction process, which can lead to non-productive time and economic losses.

Our product is aimed at optimizing and automating engineering calculations, which will eliminate errors and, most importantly, quickly respond to unforeseen complications. Sources [1,2] were used for the calculations; according to the calculations, a mathematical model was compiled, on the basis of which the software product was compiled.

Currently, the oil and gas industry software market offers a fairly wide range of similar specialized programs [3,4] distributed on a paid basis (Petrel, DiPC Engineer, GEOFFRO Fluid).

The novelty of our work lies in the fact that it is accessibility and ease of development, and most importantly, it can be used on any PC or smartphone.

In the course of drilling wells, situations arise that require prompt and specific decisions on the part of the engineering staff. The software package presented in the work is focused on the calculation of the main scenarios of accidents and stickings that occur during the work of the drilling crew. The program interface allows, by entering the current parameters of the equipment operation, to calculate the main scenarios for the development of events. This process is possible thanks to the creation of a hydraulic model.

The software package offers the ability to calculate the EDS in two hydraulic models Bingham or Power Law [1].

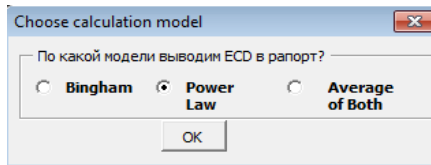


Figure 1. Calculation in two hydraulic models

To create a model and further calculation, the engineer needs to fill in the data on the object of work using the program interface. It is worth noting that data entry requires accuracy and scrupulousness. Here, tooltips play an important role when gross errors and violations are detected. The program notifies the employee about incorrect data [2].

Surface	4.02 bars
Bit	105.07 bars
Flow	43.00 bars
Annulus	0.23 bars
TOTAL	156.49 bars

Figure 2. Data entry interface

Further, the software performs the calculation and provides the employee with a detailed report on the operation of the equipment in the current situation.

Based on the output values, the employee can decide what actions to take next [3].

Drill String									Ploss (bar)	
Sect	Displ m3	OD mm	ID mm	Length m	Depth m	Cap m3	BINGHAM	P Law	P Law	
5"DP	1,58	127	108	449	449	4,12	10,5	8,6		
5"HWDP	1,54	127	76	190	640	0,87	23,6	16,8		
6,5"DC	1,44	165	71	83	722	0,33	14,1	9,7		
8" DC	1,66	203	71	58	781	0,23	9,9	6,9		
9"DC	0,71	229	76	19	800	0,09	2,4	1,7		
-	-	-	-	-	-	-	-	-	-	
TOTAL	6,92			800		5,64	60,5	43,68		
Annulus Sect	Hole D mm	Pipe OD mm	Length m	Ann Vol m ³	An Veloc m/min	Reynolds Number	Bingham P Loss bar	P Law P Loss bar	P Law Regime	
CSG-5"DP	317,90	127,00	250,40	16,70	32,7	1097,6	0,49	0,21	laminar	
OH-5"DP	311,15	127,00	199,09	12,62	34,4	1152,0	0,4067	0,18	laminar	
OH-5"HWDP	311,15	127,00	190,05	12,04	34,4	1152,0	0,3882	0,17	laminar	
OH-6,5"DC	311,15	165,10	82,74	4,52	39,9	1224,0	0,2213	0,12	laminar	
OH-8" DC	311,15	203,20	58,28	2,54	50,0	1384,2	0,2282	0,16	laminar	
OH-9"DC	311,15	228,60	19,44	0,68	62,3	1587,1	0,1111	0,09	laminar	
-	-	-	-	-	-	-	-	-	-	
TOTAL			800	49,10			1,85	0,93		

Figure 3. Data entry interface

During emergencies when working with drilling equipment, the slightest delay critically exacerbates the current situation. Employees of drilling enterprises are sometimes entrusted with a huge responsibility for the control and monitoring of drilling processes and the elimination of accidents and their consequences. Our software is designed to eliminate the slightest delay in the work of the staff, to help employees make well-reasoned and calculated decisions. Indeed, sometimes not only equipment and products are at stake, but even human lives.

Large industries are now paying great attention to the digitalization of work processes and minimizing the risk of errors. The software considered in our work makes it possible to fully use the technologies available in our time to optimize the drilling process. It is simple, fast and, last but not least, reliable. It can be installed on a PC or, in the near future, even on an ordinary smartphone.

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水泥生产中识别问题的规范程序

THE PROCEDURE FOR REGULARIZING THE IDENTIFICATION PROBLEM IN THE CEMENT PRODUCTION

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注解。 本文考虑了在操作数据不确定的情况下规范化确定磨削工艺过程问题的制定程序。 正则化过程包括通过识别不规则数据并将其从训练集中删除来对数据进行标准化。 此外, 在使用神经网络解决识别问题的算法中, 提出了对网络调整算法的修改, 引入了附加条件, 以最小化当前解与可接受的标称值的偏差。

关键词: 熟料、水泥、磨机、正规化、识别、自动化。

Annotation. The paper considers the procedure for regularizing the formulation of the problem of identifying the technological process of grinding under the uncertainty of operating data. The regularization procedure consists in normalizing the data by identifying irregular data and removing them from the training set. In addition, in the algorithm for solving the identification problem using a neural network, a modification of the network tuning algorithm is proposed with the introduction of an additional condition for minimizing the deviation of the current solution from the accepted nominal value.

Keywords: clinker, cement, mill, regularization, identification, automation.

Automation and control of operating modes of clinker grinding mills in cement production is an urgent task. Cement production is very energy intensive, therefore, increasing the efficiency of the clinker grinding process will reduce the cost of the product and improve its quality. For effective control of the mill, it is necessary to know the exact dependence of the output indicators of cement on the action of output factors and, in particular, the action of the operator. These actions are highly complex non-linear and non-stationary. Therefore, it is promising to use modern intelligent systems to support decision-making to control the grinding process.

The solution to the specified problem using a neural network to control the operation of the mill was considered in the following works [1,2,7,9]. The disadvantage of this approach is that the parameters of the process model of the operation of

the mill are determined on sufficiently long samples and, therefore, are averaged. Since for a real mill, depending on the composition, size of the initial charge, the parameters of the model, the transfer coefficients can change in wide aisles in real time (table 1), this reduces the efficiency of control when using averaged models.

To eliminate this shortcoming, in the works [3-10] it was proposed to use the theory of systems with a variable structure based on the online learning mechanism. This approach is based on the implementation of sliding modes, both when training the model and when controlling the model. The Danny approach provides robust control of the mill when changing parameters, the loaded charge (humidity, temperature, etc.) has little effect on the steady state operation. In this case, the established ordering mode is a sliding surface in space by the squeezing parameter of the mill. Around the sliding surface, an artificial fast switching to the sliding surface is artificially formed, which suppresses the disturbing effect on the operating mode of the mill. The disadvantage of this approach is the necessary organization of a fast power-switched control structure, which can translate into increased energy costs.

Table 1.
Dynamic model of the matrix

	Blaine		Krupka		Specific electricity consumption		The sound of the windmill		Mill motor rotation speed	
	Min . K		Min . K		Min . K		Min . K		Min . K	
Innings	-150		0.200		1.800		1.600		-180	
	Max. K	-10	Max. K	1.200	Max. K	1.800	Max. K	1.600	Max. K	-180
	Order Equation	second	Order Equation	second	Order Equation	second	Order Equation	second	Order Equation	second
	τ	4 min	τ	6 min	τ	10 min	τ	8 min	τ	1 min
	T1 _	2 minutes	T1 _	2 minutes	T1 _	2 minutes	T1 _	2 minutes	T1 _	2 minutes
	T2 _	3 min	T2 _	3 min	T2 _	3 min	T2 _	2.5 min	T2 _	2.5 min
Separator speed	Min . K	145.000	Min . K	0.100	Min . K	4.000	Min . K	3.75min	Min . K	-40.000
	Max. K	145.000	Max. K	2.000	Max. K	6.000	Max. K	3.75min	Max. K	-40.000
	Order Equation	second	Order Equation	second	Order Equation	second	Order Equation	second	Order Equation	second
	τ	0 min	τ	8 min	τ	10 min	τ	3 min	τ	18 min
	T1 _	1 min	T1 _	2 minutes	T1 _	2 minutes	T1 _	2 minutes	T1 _	2 minutes
	T2 _	2 minutes	T2 _	5 minutes	T2 _	3 min	T2 _	6 min	T2 _	3 min

where K are the minimum and maximum transmission coefficients; T_1, T_2 - time constants, min; τ – delay times, min.

The paper proposes the following method for solving the set tasks, which eliminates the considered shortcomings.

Method for identifying models of closed-loop grinding based on two types of statistical data;

- general statistics;
- local statistics at the current time based on the regularization method

The procedure for solving the identification problem consists of the following steps:

- formation and normalization of the general set of data on the technological process of clinker grinding;
- building a neural network non-linear model of the technological process of grinding on a normalized general data sample;
- construction of operational correction of solutions of the neural network model on local data samples based on the optimal regularization of the solution of the problem for the current time.

The first stage is that all information about the operating modes of the mill is collected. These are data from maps of operating modes, technological tests, equipment operation standards, technological instructions. All this information is summarized in the form of tables, nomograms, formulas, which together give an idea of the functioning of the mill. All the information received constitutes a general set of data, generally contradictory.

Construction of Discriminant Functions Recognizing Regular Data

$$y_i = F_i(\mathbf{c}_i; u_1, u_2),$$

$$i = 1, \dots, 5; \tag{1}$$

y_i - output variable; u_1, u_2 are input variables; \mathbf{c}_i - the vector of coefficients of discriminant functions.

Data Statistics

$$(y_{i,s}; u_{1,s}, u_{2,s}), \quad s \in I_s \tag{2}$$

I_s - set of values of statistical data indices.

Regular data satisfies the system of statistical inequalities

$$\underline{y}_i \leq y_{i,s} \leq \overline{y}_i; \quad \mu_{i,s}, \quad \mu_{i,s} \in 0.1 \tag{3}$$

$\mu_{i,s}$ – характеристические функции статистических неравенств,

$$y_{i,s} = F_i(\mathbf{c}_i; u_{1,s}, u_{2,s}), \tag{4}$$

$$\underline{u}_1 \leq u_1 \leq \overline{u}_1, \tag{5a}$$

$$\underline{u}_2 \leq u_2 \leq \overline{u}_2. \tag{5b}$$

Unknown coefficients of discriminant functions are determined based on the solution of extremal problems

$$\max_{\{c_i\}} N(c_i), \quad N(c_i) = \sum_s \mu_{is}(c_i), \quad (6)$$

N is the number of fulfilled статистических inequalities; $\underline{y}_i, \underline{u}_1, \underline{u}_2$ - minimum values; $\overline{y}_i, \overline{u}_1, \overline{u}_2$ - maximum values; s – statistics index.

Recurrent relations for the gradient method for solving systems of inequalities

$$C_{i,k} = C_{i,k-1} + \gamma \left(\sum_s \left(\underline{y}_i - F_i(C_{i,k-1}; u_{1,s}, u_{2,s}) \right)^+ \text{grad} F_i(C_{i,k-1}; u_{1,s}, u_{2,s}) + \right. \\ \left. \gamma \sum_s \left(F_i(C_{i,k-1}; u_{1,s}, u_{2,s}) - \overline{y}_i \right)^+ \text{grad} F_i(C_{i,k-1}; u_{1,s}, u_{2,s}) \right). \quad (7)$$

Data that satisfies the maximally joint subsystem of inequalities are considered regular. Data that does not satisfy the maximum joint subset of inequalities are considered irregular outliers. Irregular emissions are given from the general population of data. As a result, a normalized general data sample is formed.

A special case of solving the problem of constructing discriminant functions

$$\left(\underline{y}_i \leq y_{i1,s}(u_{1s}) \leq \overline{y}_i \right) \cup \left(\underline{y}_i \leq y_{i2,s}(u_{2s}) \leq \overline{y}_i \right), \quad (8)$$

$$y_{i1} = a_1 + b_1 u_1, \quad y_{i2} = a_2 + b_2 u_2, \quad (9)$$

$$a_i = \frac{\sum_i y_i \sum_s u_s^2 - \sum_s u_s \sum_s y_i}{N \sum_s u_s^2 - \sum_s u_s \sum_s u_s}, \quad (10)$$

$$b_i = \frac{N \sum_s u_s^2 y_i - \sum_s u_s \sum_s y_i}{N \sum_s u_s^2 - \sum_s u_s \sum_s u_s}. \quad (11)$$

At the second stage on the general data sample, neural networks are tuned, in the general case, nonlinear

$$y_i^{\text{HC}} = F_i^{\text{HC}}(\mathbf{w}_i^{\text{HC}}; u_1, u_2), \quad i \in 1, \dots, 5 \quad (12)$$

At the third stage, an operational factorial correction of the solutions obtained using the neural network is built. In contrast to the neural network model (12), factor correction is based on local sets, data obtained in the current time.

Local data samples are arrays of network errors for given input data:

$$\{\Delta y_{i,s}; u_{1,s}, u_{2,s}; s \in I_s\}_T, \quad (13)$$

$$\Delta y_{i,s} = y_{i,s}^\phi - y_{i,s}^{HC}, s \in I_s, \tag{14}$$

where $\Delta y_{i,s}$ are the actual values of the output indicators in s the t th real observation, $y_{i,s}^{HC}$ are the results of calculating the values of the output indicators y_i using neural networks for the values of the input data $u_{1,s}, u_{2,s}$.

Assume that the factor corrections are linear:

$$\Delta y_i^{kop} = a_{i0}u_0 + a_{i1}u_1 + a_{i2}u_2, u_0 = 1. \tag{15}$$

In this case, the root-mean-square correction errors have the form

$$E_{kop\ i}^2 = 0,5 \sum_s (\Delta y_{i,s}^{kop} - a_{i0}u_{0,s} - a_{i1}u_{1,s} - a_{i2}u_{2,s})^2. \tag{16}$$

The task is to determine the unknown coefficients a_{i0}, a_{i1}, a_{i2} dependencies (15) according to the criteria of minimum mean square errors (16).

For a stable and unique solution of the problem posed, we introduce an additional condition for the correction coefficients in the form of a regularizing constraint

$$R_{kop}^2 = 0,5 \sum (a_0^2 + a_1^2 + a_2^2). \tag{17}$$

As a result, the statement of the problem of minimizing the correction error is transformed into the problem of minimizing a complex criterion

$$Q_R = (1 - \alpha_R)E_{kop}^2 + \alpha_R R_{kop}^2. \tag{18}$$

In accordance with the well-known optimality conditions for the least squares method, the optimal solution is determined here based on the solution of a system of linear algebraic equations:

$$(1 - \alpha_R) \sum_{j=0}^2 c_{ij}a_j + \alpha_R a_i = (1 - \alpha_R)d_i, i = 0,1,2. \tag{19}$$

$$c_{ij} = \sum_s u_{i,s}u_{j,s}; d_i = \sum_s \Delta y_{i,s}u_{i,s}.$$

The problematic issue here is the choice of the regularization coefficient α_R .

The regularization coefficient has a direct impact on the accuracy of the forecast. Thus, for $\alpha_R = 0$, the solution to problem (18), (19) degenerates into the least squares method without regularization. This method gives the minimum error in the representation of dependence (15) only on the training data set. However, the training sample here has a local character. To evaluate the predictive properties of the obtained solution, an additional local verification sample of data is required, which is not related to the training one. Due to the local nature of the training sample here, it is possible to postulate an increased error on the verification sample with this solution. However, it is the error on the verification sample that serves as an estimate of the predictive properties of the resulting corrective dependence.

On the other hand, for, $\alpha_R = 1$ the solution will be trivial and equal to zero. In this case, the verification sample will present a solution from a neural network

tuned to the general sample according to the minimum error criterion. There is a contradiction here. Therefore, the choice of the value of the regularization coefficient should be performed on a compromise basis, for example, when, for a given regularization coefficient, the minimum value of the error on the local verification sample is reached. This is the optimal solution to the problem of choosing the regularization coefficient.

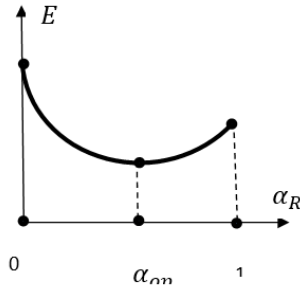


Figure 1. Graph for choosing the optimal value of the regularization coefficient

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