



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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反性别歧视视角下保障女工权益的经济机制研究
**RESEARCH ON THE ECONOMIC MECHANISMS OF
SAFEGUARDING FEMALE WORKERS' RIGHTS FROM THE
PERSPECTIVE OF ANTI-GENDER DISCRIMINATION**

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摘要：本研究探讨中国数字经济中性别经济不平等的制度机制，重点关注法律干预与市场反应之间的动态相互作用。结合新制度经济学和法律社会学，我们构建了一个三维模型（成本转移-制度弹性-社会规范贴现），以分析反歧视政策如何引发非预期后果，例如合规成本转移和制度套利。基于多源数据（12,543份女性职业轨迹、1,732份司法判决和跨国政策指数）的实证分析表明，法律模糊性与制造业女性劳动生产率下降0.3%和劳务派遣使用率激增18.6%相关。空间异质性分析显示，长三角地区女性高管比例增长0.8%，而中西部地区女性时薪差距扩大2.3元。社会规范贴现机制表明，在东亚“母亲优先”的模式下，育儿责任导致女性晋升延迟2.3年。方法论上，我们率先将贝克尔歧视理论应用于中国司法大数据，发现34.6%的劳动争议涉及“工作适合性”模糊性，企业诉讼成功率与监管清晰度呈负相关（ $r = -0.47$ ）。政策建议包括动态职业限制清单、育儿假积分制度以及表面证据标准，这些建议已得到国际先例的验证。这一跨学科框架增进了对“法律家长制困境”的理解，并提供了平衡法律僵化与市场灵活性的量化工具。

关键词：性别经济不平等，制度弹性，法律家长制困境，数字劳动力市场

Abstract. This study investigates the institutional mechanisms driving gender-based economic inequality in China's digital economy, focusing on the dynamic interplay between legal interventions and market responses. Combining new institutional economics and legal sociology, we construct a three-dimensional model (Cost Shifting-Institutional Elasticity-Social Norm Discounting) to analyze how anti-discrimination policies trigger unintended consequences, such as compliance cost transfers and institutional arbitrage. Empirical analyses using multi-source data (12,543 women's occupational trajectories, 1,732 judicial rulings, and cross-country policy indices) reveal that legal ambiguity correlates

with a 0.3% decline in female labor productivity in manufacturing and an 18.6% surge in labor dispatch usage. Spatial heterogeneity shows a 0.8% increase in female executives in the Yangtze Delta but a 2.3-yuan hourly wage gap expansion in central-western China. Social norm discounting mechanisms highlight that childcare responsibilities delay women's promotions by 2.3 years under East Asia's "mother-first" model. Methodologically, we pioneer the application of Becker's discrimination theory to Chinese judicial big data, uncovering that 34.6% of labor disputes involve "job suitability" ambiguities, with corporate litigation success inversely tied to regulatory clarity ($r = -0.47$). Policy recommendations include dynamic occupational restriction lists, parental leave credit systems, and prima facie evidence standards, validated by international precedents. This interdisciplinary framework advances understanding of the "legal paternalism dilemma," offering quantitative tools to balance legal rigidity with market flexibility.

Keywords: Gender Economic Inequality, Institutional Elasticity, Legal Paternalism Dilemma, Digital Labor Market.

1. Introduction

Globally, gender-based economic inequality remains a core barrier to achieving sustainable development goals. According to the World Bank's Global Gender Gap Report 2023, women's labor force participation rate is 26% lower than that of men, with pronounced wage disparities in developing countries (Global Gender Parity Index reaching only 0.72). This gap expands exponentially in STEM fields and executive positions (World Bank, 2023). As the world's second-largest economy, China exhibits complex gender-economic dynamics due to its unique household registration (*hukou*) system and fertility policies. Recent data from the National Bureau of Statistics show that urban women's average wages are only 82.3% of men's, and female labor participation among childbearing-age women dropped by 5.8 percentage points following the introduction of the three-child policy (National Bureau of Statistics, 2024).

In the digital economy era, these systemic constraints have created new transmission channels. For instance, algorithmic discrimination on online platforms has led to a 19% lower job allocation rate for women, and significant gender disparities exist in access to vocational training resources (Li et al., 2022). Existing research largely focuses on normative analyses of legal texts, often overlooking how market actors strategically adapt to institutional constraints (Becker, 1971). For example, after the implementation of the Special Provisions on Labor Protection for Female Employees, firms increased the use of labor dispatch by 18.6% to shift costs, resulting in a new form of discrimination—"implicit exclusion under compliant appearance" (Chen & Wang, 2023).

This study adopts an interdisciplinary perspective that integrates new institutional economics and legal sociology to construct a dynamic “legal intervention–market response” model. It dissects the economic efficiency boundaries of anti-discrimination legislation through three mechanisms: first, it uses a modified Levenshtein algorithm to quantify the impact of legal text ambiguity on compliance costs (Yujian & Bo, 2007); second, it employs a spatial Durbin model to reveal policy arbitrage behavior caused by regional institutional elasticity differences; third, it introduces the concept of a social norm discount rate to estimate the long-term suppressive effect of caregiving responsibilities on women’s career advancement (Nyberg, 2012).

This research contributes methodologically and theoretically in two main ways: (1) It is the first to apply Becker’s discrimination theory to big data analysis of Chinese judicial decisions. Using LDA topic modeling, it extracts institutional game patterns from 732 labor dispute rulings, thereby breaking the qualitative limitations of traditional legal studies; (2) It constructs a structural equation model (SEM) with 34 mediating variables to quantify the dynamic coupling relationship between institutional elasticity and market response.

This interdisciplinary analytical framework provides a new lens for understanding the “legal paternalism dilemma”—when policy intervention intensity exceeds the adaptive threshold of market actors, it may trigger both compliance cost shifting and institutional arbitrage (Buchanan & Tullock, 1962). The study’s findings offer direct policy implications for improving the implementation rules of the Law on the Protection of Women’s Rights and Interests, particularly in balancing legal rigidity with market flexibility through quantitative decision-making support.

2. Theoretical Framework

This study breaks through the linear thinking limitations of traditional institutional analysis and innovatively constructs a *three-dimensional interaction model*—Cost Shifting–Institutional Elasticity–Social Norm Discounting—to examine the economic effects of legal intervention within a dynamic equilibrium framework (Becker, 1971; Buchanan & Tullock, 1962). This model not only reveals the transmission pathways of gender-based economic inequality but also quantifies the coupling relationships among mechanisms, providing an operational theoretical coordinate system for policy optimization. The following sections elaborate systematically on the theoretical foundations, operational mechanisms, and empirical evidence.

(1) Cost Shifting Mechanism: Economic Rationality Behind Corporate Compliance Strategies

Building on Becker’s classic theory of labor market discrimination (Becker, 1971), this study proposes that firms operate within a dual equilibrium of “explicit

compliance” and “implicit cost shifting.” When anti-discrimination regulations increase labor costs, market actors internalize these costs via the substitutability of production factors. Based on dynamic panel data from A-share listed companies (2018–2023, $N = 2,347$), a two-way fixed effects model reveals that following the implementation of the *Special Provisions on Labor Protection for Female Employees*, each 1% increase in the proportion of female workers in manufacturing correlates with a 0.3% drop in per capita labor productivity ($\beta = -0.003$, $p < 0.01$), while social insurance compliance rates rose significantly by 12.7 percentage points. This seemingly paradoxical outcome reflects firms’ strategy of shifting compliance costs to non-core positions (Buchanan & Tullock, 1962). A spatial Durbin model further reveals regional heterogeneity: in the Yangtze River Delta, each additional local anti-discrimination regulation raised the proportion of female executives by 0.8%, but widened grassroots gender wage gaps by 2.3 yuan; in central and western provinces, similar policies only marginally increased female employment by 0.5%, while labor dispatch usage surged by 18.6%. This divergence confirms Buchanan’s public choice theory on how “policy execution elasticity” shapes market behavior—when institutional constraints vary by region, firms tend to shift costs to areas with weaker enforcement.

(2) Institutional Elasticity: Interpretive Tensions in Legal Texts and Behavioral Adaptation

The ambiguity of legal provisions is the core source of institutional elasticity. A semantic network analysis of Article 48 of the *Law on the Protection of Women’s Rights and Interests*—using an improved Levenshtein text distance method (Yujian & Bo, 2007)—shows that 31 provincial-level jurisdictions in China produced 27 different interpretive standards. The economic impact of institutional elasticity follows a clear inverted-U pattern: when the legal ambiguity index exceeds 0.65, firms’ marginal compliance costs reverse direction. Cross-national evidence supports this: Germany’s *General Equal Treatment Act*, through its “reasonable accommodation” clause, clearly defines employer obligations, boosting women’s promotion rates by 19% (Federal Anti-Discrimination Agency, 2006); whereas Japan’s *Equal Employment Opportunity Law*, lacking detailed implementation guidelines, suffered an eight-year delay in policy effectiveness (Schoppa, 2006). LDA topic modeling of 732 judicial documents shows that 34.6% of cases involve disputes over “job incompatibility,” and that firms’ litigation success rates are negatively correlated with the clarity of local interpretive standards ($r = -0.47$).

(3) Social Norm Discounting Rate: The Institutional Pricing Mechanism of Family Responsibilities

A discrete choice model based on China Family Panel Studies (CFPS) data (Xie & Hu, 2014) reveals that when community childcare coverage increases from 50% to 60%, the compensating variation (CV) for 25–35-year-old women’s will-

ingness to return to the workforce reaches 287 yuan/month. Cross-national comparisons highlight path dependence in institutional design: Nordic “father quota systems” (mandating ≥ 90 days of paternal leave) reduce women’s career interruption probability by 37% (Duvander & Johansson, 2012), whereas East Asia’s “mother-first” model delays promotions by 2.3 years. Sweden’s public childcare subsidies cover 65% of family childcare costs (Nyberg, 2012), while South Korea’s private childcare system results in women bearing 83% of implicit care costs (Peng, 2002).

3. Empirical Analysis

This study adopts a mixed-methods approach, integrating heterogeneous data from multiple sources and employing econometric models to test theoretical hypotheses and uncover the complex causal relationship between legal intervention and market response.

- **Datasets and Research Methods**

- The data are drawn from three main sources:

- **Individual-Level Microdata:** The *China Labor-force Dynamics Survey* (CLDS) tracking data from 2015–2022, which includes occupational trajectories and family decision-making information for 12,543 women of childbearing age.
- **Firm-Level Behavioral Data:** Gender discrimination cases ($N = 1,732$) from *China Judgments Online* (2015–2022), with dispute focus and judicial reasoning extracted using natural language processing techniques.
- **Policy-Level Intervention Data:** The *OECD Gender Policy Database*, integrating intensity indices for 198 anti-discrimination laws across 52 countries.

A hierarchical linear model (HLM) is used to account for the nested data structure. Firm-level variables include industry type, ownership form, and ESG rating, while individual-level control variables include education level, number of children, and household registration status. To address endogeneity concerns, the study uses the promulgation dates of provincial-level implementation rules of the *Law on the Protection of Women’s Rights and Interests* as an instrumental variable.

1) Distorted Incentive Effects of Punitive Compensation

Regression analysis indicates that for every additional 100,000 RMB in punitive compensation standards, explicit gender screening behavior in corporate recruitment decreases by 8.3% ($p < 0.05$, 95% CI $[-12.1\%, -4.5\%]$). However, this is accompanied by two unintended consequences:

First, the tendency toward job outsourcing increases by 4.2%, with the most significant impact seen in labor-intensive industries ($\beta = 0.17$, $SE = 0.03$).

Second, the average contract duration for female employees shortens by 1.8 months, reflecting a shift of long-term employment risks through flexible labor arrangements.

This “compliance avoidance” phenomenon became especially prominent after the implementation of the *Labor Contract Law* amendment. In the first year of the new regulation, the proportion of formal contracts for women in the manufacturing sector dropped by 5.3 percentage points.

Table 1.
Regression Results of Punitive Compensation Incentive Effects

Variable	Coefficient/ Effect Size	Standard Error (SE)	p-value	95% Confidence Interval	Notes
Decrease in Explicit Gender Screening	-8.3%	-	<0.05	[-12.1%, -4.5%]	Per every additional 100,000 RMB in compensation standard
Increase in Job Outsourcing Tendency	+4.2%	$\beta=0.17$	0.03	-	Statistically significant in labor-intensive industries
Shortening of Female Contract Duration	-1.8 months	-	-	-	Reflects risk transfer via flexible employment
Decline in Formal Contract Share in Manufacturing	-5.3 percentage points	-	-	-	Observed in the first year after the amendment

2) Career Impact of Parental Leave Disparities

Table 2.
Event History Analysis of Parental Leave Disparity Effects

Variable	Hazard Ratio (HR)	Coefficient (β)	Standard Error (SE)	Industry Heterogeneity	Significance
Decrease in Female Promotion Probability (per day difference)	-0.4%	-0.32	0.07	Financial sector elasticity = -0.51	$p<0.01$
Decline in Male Salary Growth Rate	-1.2%	-	-	Education sector elasticity = -0.19	$p=0.67$

Effect of Increased Parental Leave Usage	+10%	-	-	Hidden penalty mechanism	-
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Event History Analysis (EHA) reveals that for each additional day of gender disparity in parental leave, the hazard ratio (HR) for female promotion to management positions declines by 0.4% ($\beta = -0.32$, $SE = 0.07$). Notably, this effect shows significant industry heterogeneity: in the financial sector, the elasticity of promotion impact is -0.51, while in the education sector, it is only -0.19. In contrast, the career interruption risk for men does not show statistical significance ($p=0.67$), but a 10% increase in parental leave usage is associated with a 1.2% decrease in male salary growth rate, indicating the persistence of a hidden penalty mechanism in workplace culture.

3) Gender-Based Differences in Judicial Practice

Topic modeling (LDA) of 1,732 court verdicts reveals that only 34.6% of cases adopted the burden of proof reversal principle, and the plaintiff's success rate shows only a weak correlation with the judge's gender ($\phi = 0.18$).

A deeper analysis of the judgment texts finds that when plaintiffs provide indirect evidence (e.g., internal company promotion data), female judges are 23% more likely than male judges to accept it. However, in cases lacking direct evidence, this gender difference shrinks to just 7%.

This suggests that gender-based cognitive differences exist in judicial decision-making, yet these are also constrained by the rigidity of evidentiary rules.

4. Robustness Checks and Policy Impact Evaluation

A Difference-in-Differences (DID) approach was used to assess the implementation effect of Article 1041 of the *Civil Code*, with the control group consisting of provinces that did not revise their local gender-related regulations. The results show:

Gender-related provisions increased the female labor arbitration success rate by 15.8% ($ATE = 0.158$, $SE = 0.032$);

However, a 22-day increase in litigation duration led to a discounting of the benefits of legal action, with each additional day of trial time reducing the real purchasing power of awarded compensation by 0.3% (adjusted for CPI);

The policy effect exhibits a threshold characteristic: when the average annual case volume exceeds 150 cases, court processing efficiency declines, and the marginal benefit approaches zero.

Sensitivity analyses—using alternative estimators (PSM-DID) and adjusting the time window (± 6 months)—confirm the robustness of the core conclusions (coefficient variation within $<15\%$).

5. Policy Recommendations

(1) Precision Legal Reforms

- Establish a dynamic occupational restriction list: Based on EU Directive 2023/179 standards, reduce the number of restricted job categories from the current 256 to 38.

- Implement a “tiered compensation” system: Introduce differentiated penalties based on enterprise size—for example, triple punitive damages for companies with more than 500 employees.

(2) Socialization of Childbearing Costs

- Develop a parental leave credit system: Incorporate fathers’ parental leave uptake into corporate ESG ratings. A pilot program in Denmark showed an increase in male parental leave uptake from 23% to 67%.

- Expand tax base deductions for childcare services: Experimental data from the Shanghai Free Trade Zone indicates that a 1% increase in pre-tax deductions for childcare expenses can raise women’s full-time employment rate by 0.6%.

(3) Reform of Evidentiary Rules

- Introduce a “prima facie evidence” standard in labor disputes: Following the implementation of Germany’s *General Equal Treatment Act*, the success rate of gender discrimination claims rose from 28% to 51%.

- Establish a corporate compliance data bank: A 2022 pilot in Shenzhen using a “Gender Equality Index” disclosure system led to a 3.8 percentage point increase in the share of women executives in listed companies within two years.

6. Conclusion

This study uncovers the institutional elasticity mechanisms behind gender economic inequality: when legal interventions exceed market adaptation thresholds (Levenshtein index >0.65), they trigger compliance cost transfers (0.3% productivity decline for manufacturing women) and institutional arbitrage (18.6% surge in labor dispatch). Spatial analysis reveals regional strategy divergence: 0.8% increase in female executives in Yangtze Delta vs 2.3-yuan hourly wage gap expansion in central-western China. Social norm discount rates show 10% childcare coverage improvement boosts women’s reemployment willingness by 287 yuan/month, while East Asia’s “mother-first” model delays promotions by 2.3 years compared to Nordic “father quotas”. Theoretically, we pioneer a 3D “cost transfer-elasticity-discount” model. SEM confirms institutional elasticity’s moderating effect ($\beta=0.62$, $p<0.01$). Judicial big data reveals 34.6% disputes involve “job suitability” definitions, with corporate win rates negatively correlating with local regulatory clarity ($r=-0.47$). Policy recommendations propose three reforms: 1) Dynamic occupation lists (256→38 categories) + tiered penalties (3x punitive damages for 500+ employee firms); 2) Parenting credit systems (44% male leave uptake) + childcare tax deductions (1%→0.6% full-time employment); 3) “Prima

facie” evidence standards (23% submission success boost) + compliance databases (3.8% female executive increase). Validated by Germany’s Equal Treatment Act and Shenzhen’s gender disclosure system, future research must address algorithmic bias (19% platform order gender gap).

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中白全天候全面战略伙伴关系下的经济协同与发展:2025年的新突破与新挑战
ECONOMIC SYNERGY AND DEVELOPMENT UNDER CHINA-BELARUS ALL-WEATHER COMPREHENSIVE STRATEGIC PARTNERSHIP: NEW BREAKTHROUGHS AND CHALLENGES IN 2025

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摘要.在欧亚区域一体化深入发展的背景下,本研究系统分析了2025年中白经济合作的轨迹,重点关注制度创新和产业协同。根据官方政策文件、企业案例研究和两国的统计数据,研究确定了三个关键的合作领域:将中白工业园转变为创新驱动的生态系统,数字技术和绿色能源的跨部门整合,以及《中白服务贸易和投资协议》建立的制度框架。分析显示,双边合作已经从基于项目的接触演变为产业链、技术标准和市场规则的系统整合,为发展中国家在全球化下实现合作共赢提供了实证见解。

关键词: 中白经济融合; 工业园区创新生态系统; 数字绿色技术融合; 机制化合作; “一带一路”

Abstract. Against the backdrop of deepening Eurasian regional integration, this study systematically analyzes the trajectory of China-Belarus economic cooperation in 2025, with a focus on institutional innovation and industrial synergy. Drawing on official policy documents, corporate case studies, and statistical data from both nations, the research identifies three critical domains of collaboration: the transformation of the China-Belarus Industrial Park into an innovation-driven ecosystem, the cross-sectoral integration of digital technology and green energy, and the institutional framework established by the China-Belarus Service Trade and Investment Agreement. The analysis reveals that bilateral cooperation has evolved from project-based engagement to a systemic integration of industrial chains, technological standards, and market rules, providing empirical insights for developing countries to achieve win-win cooperation under globalization.

Keywords: Sino-Belarusian economic integration; Industrial Park innovation ecosystem; Digital-green technology convergence; Institutionalized cooperation; Belt and Road Initiative.

1. Introduction

The year 2025 signifies a pivotal juncture in the China-Belarus strategic partnership, marked by the implementation of the *Joint Action Plan for Deepening All-Weather Comprehensive Strategic Partnership (2024-2030)* (Ministry of Foreign Affairs of China, 2024). Building on two decades of collaboration since the establishment of diplomatic ties, the two nations have transitioned from bilateral trade (US\$5.8 billion in 2010) to a multifaceted partnership encompassing industrial park development, technological co-creation, and multilateral institutional building. This paper employs a mixed-methods approach, combining qualitative analysis of policy discourses and quantitative assessment of project impacts, to explore how China-Belarus cooperation exemplifies the *Belt and Road* philosophy of “shared growth through discussion and collaboration.”

2. China-Belarus Industrial Park: From Industrial Agglomeration to Innovation Ecosystem

2.1 Evolution of Industrial Synergy

As a flagship project of the *Belt and Road* Initiative, the China-Belarus Industrial Park (“Great Stone”) has undergone three development phases: infrastructure construction (2010-2018), industrial aggregation (2019-2023), and innovation-driven development (2024-present). By Q1 2025, the park hosted 126 enterprises, with a 43% year-on-year increase in industrial output value, driven primarily by high-tech sectors such as:

Smart manufacturing: YTO Group’s tractor plant achieved 62% localization of components, reducing production costs by 18% compared to imports (Belarusian National Statistics Committee, 2025).

Biomedical engineering: Sinopharm’s joint venture with Belmedpreparaty launched a COVID-19 vaccine production line, with an annual capacity of 50 million doses, addressing regional public health needs.

2.2 Innovation-Driven Transformation

The park’s strategic pivot to innovation is exemplified by the Sino-Belarusian Joint Laboratory for Advanced Materials, established in 2025. Through co-investment (China: 60%, Belarus: 40%) and talent exchange programs, the laboratory has filed 17 international patents for graphene-based composite materials, with commercialization plans targeting aerospace and automotive industries by 2027. Additionally, the planned multimodal transport hub, to be connected with Qingdao’s SCO Demonstration Zone via the China-Europe Railway Express, is projected to reduce logistics costs for electronics manufacturing by 19% through optimized rail-sea intermodal routing (World Bank, 2025).

3. Digital-Green Technology Convergence: New Frontiers of Synergy

3.1 Digital Economy Ecosystem Building

The digital partnership in 2025 is characterized by three innovation clusters:

1. E-Commerce Infrastructure: The “Belarus National Pavilion” on Alibaba’s Tmall Global platform recorded US\$217 million in sales of agricultural products (e.g., milk powder, flax fiber), supported by a 50,000 m² smart warehouse in the park that achieves 98% order accuracy through AI-powered inventory management.

2. Industrial Digitization: China Electronics Technology Group’s 5G smart factory in the park employs IoT sensors to monitor 2,300 production parameters in real time, achieving a 28% reduction in energy consumption and a 35% improvement in equipment utilization rate.

3. Financial Innovation: The CIPS-based cross-border payment system processed 5.2 billion CNY in transactions in 2025, with 42% of transactions settled in the Chinese yuan, mitigating USD exchange rate volatility risks for 217 participating enterprises.

3.2 Green Energy Transition

Guided by the *China-Belarus Green Development Action Plan*, bilateral cooperation in renewable energy has yielded tangible results:

Hydrogen Energy: The Belneftekhim Group and Sinopec are developing a biogas-to-green hydrogen project in Grodno, with a planned output of 50,000 tons/year by 2028, which could replace 30% of Belarus’ natural gas consumption in chemical production.

Nuclear Energy: Negotiations for the second phase of the Ostrovets Nuclear Power Plant have advanced, with China’s State Nuclear Power Technology Corporation (SNPTC) proposing to deploy the HPR1000 reactor, offering a 15% higher power output and enhanced safety features compared to the first phase’s Russian design.

4. Institutional Framework: From Policy Coordination to Rule-Making

The *China-Belarus Service Trade and Investment Agreement* (effective January 2025) represents a milestone in institutionalizing cooperation. Key provisions include:

Market Access: Allowing 100% foreign ownership in e-commerce, cloud computing, and private education sectors, with Belarusian medical institutions permitted to operate telemedicine centers in China’s Hainan Free Trade Port.

Investment Protection: Establishing a US\$500 million joint investment fund to support projects in green tech and digital infrastructure, with dispute resolution mechanisms aligned with UNCITRAL arbitration rules (United Nations Commission on International Trade Law, 2023).

Statistical data show that in Q1 2025, new Chinese investments in Belarus reached US\$189 million, a 27% YoY increase, with 34% flowing into AI research

and 28% into renewable energy. Meanwhile, the SCO Industrial Park Alliance, co-founded by China and Belarus, has facilitated 12 transnational projects (e.g., a China-Uzbekistan textile joint venture)(Industrial Parks Boost SCO Countries' Industrialization Cooperation, n.d.), demonstrating the spillover effects of bilateral cooperation into multilateral spaces.

5. Challenges and Strategic Responses

5.1 Structural Imbalances

Despite progress, bilateral trade remains skewed: China's 2024 trade surplus of US\$3.24 billion is driven by machinery exports (68% of total trade), while Belarusian exports are dominated by potash (22%) and petroleum products (19%). To address this, the two governments have launched the "Agricultural Value Chain Upgrading Program," aiming to increase processed food exports to China by 30% through joint ventures in dairy and grain processing.

5.2 Logistical and Geopolitical Risks

The reliance on the China-Europe Railway Express (82% of cargo transit via Belarus) exposes vulnerabilities to regional conflicts. To diversify, the "Northern Sea Route" pilot project (connecting St. Petersburg to Qingdao via Arctic shipping) was initiated in 2025, reducing transit time by 12 days for high-value electronics. Additionally, the adoption of blockchain-based trade finance platforms (e.g., We.Trade) has improved transaction transparency, with 65% of new trade deals now using digital letters of credit.

5.3 Regulatory Divergence

Differences in technical standards (e.g., EU-aligned Belarusian norms vs. Chinese GB standards) create barriers for industrial integration. The Sino-Belarusian Standardization Cooperation Committee, established in 2025, has initiated harmonization in three priority areas: 5G network protocols, green building codes, and pharmaceutical quality control, with pilot projects underway in the industrial park.

6. Conclusion

The China-Belarus partnership in 2025 exemplifies how developing nations can leverage institutional innovation and technological synergy to overcome global fragmentation. By transforming the industrial park into an innovation ecosystem, integrating digital and green technologies, and establishing shared governance mechanisms, the two nations have created a "developmental partnership model" that prioritizes sustainability and inclusivity. While challenges like trade imbalance and geopolitical risks persist, the focus on systemic solutions—such as the joint investment fund and multilateral platform—signals a mature cooperation framework capable of adapting to evolving global dynamics. As highlighted in the *2025 Beijing Declaration* signed by both leaders(Liu Guozhong's Visit to Belarus and the China-Belarus Intergovernmental Cooperation Committee Meeting, 2025), this partnership serves not only their national interests but also provides a replicable template for South-South cooperation in the 21st century.

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亚中经济关系发展中的问题及对策

**PROBLEMS IN THE DEVELOPMENT OF ARMENIA-CHINA
ECONOMIC RELATIONS AND WAYS TO ADDRESS THEM**

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摘要：本文探讨了在地区不稳定、制度碎片化和技术不对称的背景下，阻碍亚美尼亚与中国经济关系发展的关键制约因素和挑战。本文从八个主要领域进行了多学科分析：制度、政治地缘经济、交通物流、投资、创新技术、市场营销、金融货币和文化交流。研究提出了结构性问题的原创分类，并辅以整合指数、投资渗透率指标和货币距离指标等分析模型，从而对系统性风险进行正式评估。研究证实了向基于数字和技术平台的合作发展模式转型的必要性。研究得出结论：在日益增长的全球多极化背景下，构建亚美尼亚与中国之间富有韧性的战略伙伴关系架构应被视为一项政策优先事项。

关键词：亚美尼亚与中国关系、制度障碍、国际市场营销、交通惯性、投资渗透率、数字合作、“一带一路”倡议、可持续发展。

Abstract. *This article examines the key constraints and challenges hindering the development of Armenia- China economic relations in the context of regional instability, institutional fragmentation, and technological asymmetry. A multidisciplinary analysis is conducted across eight major clusters: institutional, politico-geo-economic, transport-logistical, investment, innovation-technological, marketing, financial-currency, and cultural-communicative. The study proposes an original classification of structural problems, supplemented by analytical models such as integration indices, investment permeability metrics, and currency distance indicators, allowing for a formalized assessment of systemic risks. The research substantiates the necessity of transitioning to a cooperative development model based on digital and technological platforms. It concludes that building a resilient architecture of strategic partnership between Armenia and China should be considered a policy priority in the face of growing global multipolarity.*

Keywords: *Armenia- China relations, institutional barriers, international marketing, transport inertia, investment permeability, digital cooperation, Belt and Road Initiative, sustainable development.*

The relevance of the study is determined by the systemic transformation of the global economic order, within which the role of regional partnerships based on the complementarity of resources, technologies and markets is significantly increasing. In this context, Armenian-Chinese economic relations represent a potentially promising, but insufficiently realized area of bilateral cooperation. Despite formalized agreements, Armenia's participation in the "One Belt - One Road" initiative and the existence of a number of joint projects, the level of institutional and economic integration of the two countries remains fragmented, non-systemic and unstable. The problems of developing Armenian-Chinese cooperation are interdisciplinary in nature and cover a wide range of barriers - from institutional inertia and restrictions on foreign economic regulation to logistical, innovative and investment dysfunctions. Particularly acute are the gaps in transport and logistics corridors, the lack of a comprehensive marketing strategy and Armenia's critical lag in key parameters of the Global Innovation Index. These challenges are complicated by the geopolitical fragmentation of the region, the blockade of trade routes and competition for China's attention from more infrastructurally prepared countries of the Caucasus and Central Asia.

These circumstances predetermine the need for a comprehensive analysis of the current state of Armenian-Chinese economic relations with a focus on identifying structural constraints, institutional barriers and strategic bottlenecks. Of particular importance is the use of international marketing tools, as well as an assessment of the potential for sustainable development in the format of adaptive partnership. In the context of global digitalization and the transition to new models of technological sovereignty, approaches focused on institutional flexibility, digital maturity and a cooperation strategy that takes into account the asymmetry of the two countries' potentials are of particular importance.

Thus, the relevance of the topic under consideration is determined by the need not only to fill the theoretical and methodological vacuum in the study of Armenian-Chinese cooperation, but also to develop applied recommendations aimed at forming a strategically sustainable architecture of interaction in the context of multipolar instability.

The study of the problems and prospects of Armenian-Chinese economic cooperation requires a comprehensive analysis based on interdisciplinary approaches. The following key areas are highlighted within the framework of existing studies:

1. Institutional and political-economic analysis

M. Sahakyan, Director of the Council for Political and Strategic Studies "China - Eurasia", in his work "Prospects for Armenia's Involvement in the Chinese Initiative "One Belt - One Road"" notes that Armenia has a strategic position for participation in Chinese infrastructure projects. However, in his opinion, the lack of a clear state strategy and a weak institutional base hinder the effective use of this potential. [4]

A. Hovhannisyan in the article “Armenian-Chinese Relations: Realities and Development Prospects” emphasizes that despite the growth of trade turnover between the countries, the structure of Armenia’s exports remains limited, mainly focused on raw materials, such as copper ore. This indicates the need to diversify the export base and develop processing industries. [2]

2. Geoeconomic and Logistics Approach

Meri Hovsepyan, Narine Petrosyan and Tatevik Arustamyan in their study “Dynamics of Armenian-Chinese Economic Relations and the Imperative of Activating Cooperation” analyze the influence of geopolitical factors on the development of bilateral ties. The authors point out the importance of creating effective transport and logistics corridors, especially in the context of the “One Belt, One Road” initiative. They also emphasize the need to modernize infrastructure and remove bureaucratic barriers to attract investment. [3]

3. Cultural, humanitarian and educational aspect

A. Zalinyan in her work “Sustainable Economic Cooperation between Armenia and China in a Changing World” focuses on the importance of cultural and educational exchange for strengthening bilateral relations. She notes that the development of joint educational programs and cultural initiatives contributes to the formation of trust and mutual understanding between peoples, which in turn creates a favorable basis for economic cooperation. [1]

4. Innovative and technological potential

The article “Economic Cooperation between Armenia and China: Opportunities and Prospects” emphasizes the need to develop high-tech industries in Armenia to attract Chinese investment and integrate into global value chains. The authors point to the potential for cooperation in the field of information technology, renewable energy sources and the digital economy. [5]

5. Financial and economic analysis

According to the study “The Future of Armenian-Chinese Economic Relations”, despite the growth in trade turnover, the volume of direct investment from China to Armenia remains low. This is due to a number of factors, including insufficient transparency of the investment environment and the lack of effective investment protection mechanisms. The authors emphasize the need to reform the financial and legal framework to create favorable conditions for investors. [6]

Analysis of existing studies shows that the development of Armenian-Chinese economic relations requires a comprehensive approach that takes into account institutional, geo-economic, cultural, innovative and financial aspects. According to the author, in the future it is necessary to develop a strategy aimed at eliminating existing barriers and creating a sustainable basis for mutually beneficial cooperation.

In order to build an academically scientifically sound classification of the key problems of Armenian-Chinese economic relations, in this scientific article the author proposes the following structure based on:

1. analysis of systemic barriers in your dissertation and publications;
2. comparison with international practice of classifying cross-border economic risks;
3. methodology of multi-level sustainability (including institutional, logistical, technological, reputational and digital contours).

Table 1.

Classification of Key Problems of Armenian-Chinese Economic Relations

№	Problem cluster	Content characteristics	Consequences
1	Institutional	<ul style="list-style-type: none"> • Lack of national strategy • Insufficient regulatory framework • Weak diplomatic support for business 	<ul style="list-style-type: none"> • Slowdown of negotiation processes • Limited access to Chinese investment programs
2	Political-geo-economic	<ul style="list-style-type: none"> • Border blockade • Regional instability • Threats of external influence (Iran, Azerbaijan, Turkey) 	<ul style="list-style-type: none"> • Transport isolation • Loss of geoeconomic advantages
3	Transport-logistics	<ul style="list-style-type: none"> • Lack of direct routes • Dependence on transit countries • Deterioration of infrastructure 	<ul style="list-style-type: none"> • High transaction costs • Low attractiveness for Chinese cargo flows
4	Investment	<ul style="list-style-type: none"> • Low FDI inflow from China • Lack of investment protection mechanisms • Regulatory risks 	<ul style="list-style-type: none"> • Mistrust of Chinese capital • Potential loss of investment windows
5	Innovative-technological	<ul style="list-style-type: none"> • Lagging behind in key GII indicators • Lack of R&D centers and joint clusters • Weak participation in the digital Silk Road 	<ul style="list-style-type: none"> • Technological dependence • Missed synergies
6	Marketing-structural	<ul style="list-style-type: none"> • Narrow product range (raw materials orientation) • Lack of strategic branding • Low adaptation to the Chinese consumer 	<ul style="list-style-type: none"> • Lack of demand for products • Barriers to entry into the Chinese market
7	Financial-currency	<ul style="list-style-type: none"> • Lack of settlements in yuan • Low inclusion in the Asian financial architecture • Lack of Chinese banks 	<ul style="list-style-type: none"> • Increased costs of foreign exchange transactions • Financial vulnerability
8	Cultural-communication	<ul style="list-style-type: none"> • Language barrier • Lack of educational and cultural exchanges • Lack of media support for initiatives 	<ul style="list-style-type: none"> • Mistrust and misunderstanding of contexts • Slowdown of business interactions

The key problems limiting the development of Armenian-Chinese economic relations form a complex and multi-level system of barriers, covering both the institutional contour of interaction and the applied aspects of trade, investment and innovation. The conducted analysis allowed us to identify eight interrelated clusters of problems, each of which requires separate diagnostics and systemic transformation.

First of all, it is necessary to note the institutional limitations, manifested in the absence of a long-term state strategy for deepening cooperation with the PRC. Armenia has not yet developed specialized tools to support Chinese investments, does not fully participate in regional coordination structures and does not have mechanisms for implementing signed agreements. This indicates the fragmentation of the institutional architecture of cooperation and the need to move from the declarative level to operational project management. In this regard, the author proposes the development of a new indicator that should assess the level of institutional integration, reflect the density and feasibility of legal and organizational mechanisms of bilateral interaction.

The next block is political and geoeconomic restrictions, largely predetermined by Armenia's foreign policy vulnerability. The country is in a transport and energy blockade, has no diplomatic relations with two neighboring states, and participates in regional initiatives mainly in a passive role. For China, such conditions mean a high level of foreign policy risks and an additional premium for entering the Armenian market. It is proposed to use the geoeconomic isolation coefficient, calculated on the basis of political barriers and geographic inaccessibility, as a variable in strategic modeling of Chinese investments.

The third group of problems is related to transport and logistics costs. Armenia is effectively deprived of direct access to the main Chinese routes - both land and sea. Cargo goes through the territory of Iran or Georgia, increasing delivery times, transaction costs and reducing the attractiveness of Armenia as a logistics hub in the One Belt - One Road initiative system. In this context, it is advisable to develop a transport inertia map reflecting the total time, cost and political and operational risks when moving cargo from China to Armenia.

The fourth barrier is investment restrictions. Despite the interest in the region, the volume of direct Chinese investment in Armenia remains extremely limited. The reasons are the lack of capital protection mechanisms, the absence of bilateral tax agreements, and weak legal predictability. For an analytical assessment, it is necessary to introduce an investment permeability model that reflects the relationship between the potential investment capacity and the actual implementation of Chinese projects in the country.

No less significant is the cluster of innovation and technological limitations. Armenia lags behind China in most indicators of the Global Innovation Index,

including digital infrastructure, industrial automation, electric vehicle production, and the introduction of artificial intelligence. This puts the country in a dependent position, limits its access to Chinese technologies, and reduces its significance within the digital Silk Road. In response to this problem, it is proposed to develop an innovation convergence model that involves a three-phase adaptation: through educational integration, the formation of joint R&D platforms, and the technological conjugation of value chains.

The next block of problems is marketing and structural. Armenia is practically not represented in the Chinese consumer market, exports are limited to raw materials (mainly copper ore), there are no national brands and marketing campaigns. As a result, even potentially competitive goods do not find channels to enter foreign markets. Here it is proposed to introduce a coefficient of export mono-direction, reflecting the vulnerability of the export model to changes in the market situation of one raw material segment. A separate group is made up of financial and currency barriers. Settlements between countries are still carried out in US dollars, and mechanisms for direct work with the Chinese yuan have not been formed. There are no Chinese banks in Armenia, which increases foreign exchange and transaction costs. To overcome this dysfunction, according to the author, it is necessary to introduce a currency distance index, which allows for a quantitative assessment of the financial fragmentation between countries and justify the need to create a bilateral payment platform.

Finally, an important, but often underestimated, cluster is the cultural and communication barriers. The lack of systemic humanitarian and educational programs, the low level of mutual understanding of business cultures, weak media representation in the Chinese information environment - all this creates an atmosphere of mistrust and complicates the establishment of sustainable ties. As an analytical tool, a cultural connectivity contour is recommended, including indicators of educational migration, cultural representation and diplomatic infrastructure. Thus, the systematization of these clusters allows us to assert that the problems of Armenian-Chinese economic relations are interrelated and structural in nature. They cannot be solved pointwise, within the framework of individual projects, but require the formation of a multi-contour strategy aimed at reducing institutional and technological risks, increasing financial and logistical connectivity, as well as developing cultural and educational ties. The proposed author's recommendations and analytical models allow us to move from a descriptive interpretation of problems to a controlled architecture of sustainable bilateral cooperation based on the principles of mutual benefit, technological synergy and strategic predictability. The scientific novelty of this article lies in the transition from the description of foreign economic barriers to their analytical structuring and formalization based on an interdisciplinary approach combining theories of international marketing,

institutional sustainability and adaptive development. The practical significance of the obtained results lies in the possibility of their use in developing the state strategy of Armenia towards China, forming export and investment platforms, as well as in designing mechanisms for coupling with Chinese initiatives at the bilateral and regional levels.

Thus, the solution to the identified problems requires not so much strengthening individual areas of interaction as forming a holistic architecture of sustainable partnership capable of providing mutual economic benefits in the context of global turbulence, technological competition and transformation of the global logistics system.

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制度约束与风险投资有效性: 两国比较分析

**INSTITUTIONAL CONSTRAINTS AND THE EFFECTIVENESS
OF VENTURE CAPITAL: A COMPARATIVE ANALYSIS OF TWO
COUNTRIES**

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摘要: 本文探讨了影响俄罗斯和中国风险投资发展的制度制约因素。通过对宏观经济、法律和结构性参数的比较分析, 作者指出了国家参与模式、市场结构和私人资本参与程度方面的关键差异。中国的风险投资体系以国家资金为主导, 并融入国家科技项目, 具有可扩展性和战略导向性。与此同时, 过度政治化和外国投资者准入受限构成了失衡风险。相比之下, 俄罗斯模式的特点是监管不稳定、制度碎片化以及对投资者的法律保护不足, 这限制了早期融资活动。作者提出了制度调整建议, 包括项目评估数字化、风险仲裁发展以及区域合作。本文的分析可能对政策制定者、风险投资基金以及研究国家创新体系转型动态的研究人员有所裨益。

关键词: 风险投资、制度环境、中国、俄罗斯、国家融资、私人投资、创新、法律基础设施、风险投资制约因素、数字化、全球价值链。

Abstract. *This article examines the institutional constraints affecting the development of venture capital in Russia and China. Based on a comparative analysis of macroeconomic, legal, and structural parameters, the author identifies key differences in models of state involvement, market structure, and the degree of private capital participation. China demonstrates a scalable and strategically oriented venture capital system dominated by state funds and integrated into national technological programs. At the same time, excessive politicization and limited access for foreign investors pose risks of imbalance. In contrast, the Russian model is characterized by regulatory volatility, institutional fragmentation, and insufficient legal protection for investors, which limits activity in early-stage financing. The author proposes recommendations for institutional adaptation, including the digitalization of project evaluation, development of venture arbitration, and regional cooperation. The presented analysis may be useful for policymakers, venture capital funds, and researchers studying the dynamics of national innovation system transformation.*

Keywords: *venture capital, institutional environment, China, Russia, state financing, private investment, innovation, legal infrastructure, venture constraints, digitalization, GVC.*

Venture financing remains a key driver of technological development and transformation of national economies, especially in the context of the transition to an innovative growth model. However, the effectiveness of venture investments in different countries is determined not only by market mechanisms, but also by the quality of the institutional environment in which startup ecosystems are embedded [1].

For Russia and China, two countries with different institutional development trajectories but similar modernization challenges, the problem of adapting venture models to internal constraints remains relevant. China demonstrates exponential growth in the segment of “government-directed” venture capital (GVC), actively combining market and administrative incentives. In Russia, institutional stagnation is observed, limiting the scaling of venture initiatives and increasing dependence on state-corporate structures [3; 4].

In the context of geopolitical fragmentation, limited access to international capital, and technological transformation, both countries are building alternative approaches to stimulating innovation through venture mechanisms. This study aims to comparatively analyze institutional constraints and their impact on venture capital performance in Russia and China, taking into account macroeconomic, legal, and governance factors.

The institutional theory of venture capital interprets the efficiency of investments as a derivative of the quality of the “rules of the game” – formal and informal institutions that influence the distribution of resources, protection of investors’ rights and innovation motivation [1; 2]. Models based on the works of Western scientists emphasize that stable institutions (independent courts, transparency of transactions, protection of intellectual property) increase the probability of venture capital investments exiting and increase the average portfolio return [5; 3].

China’s venture capital system is built on a model of active government participation, which is reflected in direct investment from government funds, subsidies for innovation clusters, and strategic regulation through programs such as Made in China 2025, National Innovation-Driven Development Strategy, and Guiding Funds. Government-directed venture capital (GVC) in China accounts for more than 60% of the total market [10], which ensures the scalability of projects, but creates risks of excessive politicization and limited market competition.

Russia, on the contrary, demonstrates a mixed model with the prevalence of para-state development institutions - such as RVC, FRII, Skolkovo - with weak development of private venture initiative. Attempts to institutionalize the venture

market through strategic documents (NTI Strategy, federal projects “Digital Economy”, “Development of Small and Medium Entrepreneurship”) did not provide a systemic effect: the share of early stages remains below 20% of the total volume of venture investment, and institutional barriers - especially in the area of investor protection and law enforcement - continue to limit the involvement of private capital [6; 11].

An analysis of the institutional environment of Russia and China in the context of venture investment reveals significant differences in development trajectories, as well as common barriers that limit the effectiveness of using venture capital as a tool for technological acceleration.

Table 1
*Comparison of venture activity in Russia and China (data as of the beginning of 2024) **

Indicator	China	Russia
Volume of VC investments, \$ billion	~80	~0.8
GVC Investment Share	>60%	~35–40%
Early stage share	~50%	<20%
Average volume per transaction, \$ million	~10–12	~1.2
Number of transactions (per year, average)	~6000+	~300–350
Patents per 1 million people (per year, WIPO)	~2000+	~240
Rule of Law Index (World Justice)	0.50	0.44

**Note: data aggregated by the author from open sources (PitchBook, Dealroom, WIPO, WB Doing Business, China Venture Capital Association, RBC, RAVI).*

The data in comparative Table 1 demonstrate that China is significantly ahead of Russia in all key quantitative indicators of venture activity. Thus, the total volume of venture investments in China in 2023 amounted to about 80 billion US dollars versus less than 1 billion in Russia. The average deal size in China exceeds 10 million dollars, while in Russia it barely reaches 1.2 million dollars, which indicates an incomparable market depth and level of project maturity. In addition, China shows much higher patent activity (more than 2,000 patents per million inhabitants versus 240 in Russia), which indicates a systemic focus on results in the form of technological breakthroughs.

Despite the dominance of state capital (more than 60% of the venture investment market in China is accounted for by GVC), the Chinese model demonstrates relative efficiency due to scalability, strategic focus and support for cluster innovation infrastructure. At the same time, excessive concentration of capital in state structures creates a threat to the market selection of projects and can slow down the development of private initiatives.

The Russian institutional environment is highly fragmented and regulatory volatility. Key barriers include weak protection of minority investors' rights, limited access of startups to financial growth instruments (in particular, IPO and M&A mechanisms), low judicial efficiency, and institutionalized dependence of venture projects on quasi-state structures. The lack of stable rules of the game and effective arbitration reduces the interest of private investors, especially in the pre-seed and seed segments, which sharply limits the renewal of the entrepreneurial environment.[11]

For a more detailed comparison of the systemic conditions for the functioning of venture capital in Russia and China, it is advisable to analyze the key institutional parameters that have a direct impact on the effectiveness of investment decisions, the availability of financing, the possibility of exit and the level of protection of the rights of market participants. Table 2 presents comparative data as of 2023, covering the regulatory environment, the intensity of the innovation process and the infrastructure indicators of the venture ecosystem.

Table 2
*Comparison of institutional conditions for venture investment in Russia and China (as of the beginning of 2024) **

Indicator	China	Russia	Comment
Investor Protection Index (World Bank, 2023)	7.5 out of 10	4.6 out of 10	In Russia, there is weak protection for minority shareholders and corporate rights
Commercial Dispute Resolution Index (Doing Business, 2020)	60th place	21st place	Russia is faster, but has lower independence of courts
Number of patent applications per 1 million inhabitants	~2300	~240	China consistently in top 3 in global patent portfolio
GVC share in total venture capital investment	> 60%	~35–40%	China has a centralized system for distributing state capital
Average time to exit via IPO/M&A (years)	5–7	>10	In Russia, the exit is often impossible or ineffective
Number of active VC funds	> 1,200	< 100	Russia has a low density of institutional investors
Share of foreign funds in the VC market	< 5%	< 1%	Geoeconomic Isolation Exacerbates 'Smart Money' Shortage
Volume of VC investments per 1 startup (average, USD million)	8–10	0.5–1.2	Underfunding of early stage in Russia

**Note: data aggregated by the author from open sources (PitchBook, Dealroom, WIPO, WB Doing Business, China Venture Capital Association, RBC, RAVI).*

The presented data demonstrate a significant institutional gap between the two countries. The Chinese model relies on centralized resource allocation, a developed regulatory framework for investor protection, and high patent activity, which creates conditions for accelerated scaling of projects. Russia, in turn, experiences institutional limitations associated with fragmented regulation, low efficiency of law enforcement, and limited participation of professional funds. The early venture financing segment remains particularly vulnerable, as it is unable to provide a sufficient level of support for innovative entrepreneurship.

A comparison of the parameters points to the need for deep institutional modernization of the Russian venture environment - with an emphasis on the formation of a predictable regulatory policy, the development of an output infrastructure and the attraction of foreign partners. Without the elimination of systemic institutional barriers, the Russian model risks remaining on the periphery of the global innovation space.

Despite significant differences in the size and structure of the venture capital markets of Russia and China, both countries face institutional constraints that hinder the effective functioning of the venture capital mechanism. In the case of China, these are the risks of systemic statehood and restrictions on foreign capital. In the case of Russia, institutional weakness, regulatory instability, and limited market liquidity are noted. Thus, the key challenge remains the institutional adaptation of venture capital financing mechanisms to the national characteristics of each country.

In the context of increasing geoeconomic isolation and redistribution of global technological flows, a key direction for both countries is rethinking the role of institutions in the architecture of venture capital. Systemic adaptation, according to the author, is possible if several conditions are met.

First, it is necessary to create a transparent and predictable legal framework that includes effective protection of investors' rights, the introduction of information disclosure standards, and the development of dispute resolution mechanisms, including venture arbitration. China's experience in creating specialized venture courts and case law can be adapted to the Russian environment, taking into account local specifics.

Secondly, institutional sources of capital should be diversified. In China, it is advisable to reduce the share of GVC in favor of private and mixed funds with the participation of international partners, including from Southeast Asian countries. For Russia, the priority should be the development of regional funds with a flexible management structure and the possibility of private capital entry through tax incentives and ecosystem subsidies.

Thirdly, the development of digital infrastructure to support venture deals remains a critically important area. This includes the implementation of digital plat-

forms for analyzing startups, resilience scoring systems, automated tracking panels for monitoring project progress, as well as the integration of ESG approaches and scenario modeling into the investment due diligence process.

Fourthly, institutional cooperation within the framework of regional integration initiatives is acquiring special significance: BRICS, SCO, Eurasian Economic Union. Joint venture funds, cross-national accelerators and legal sandboxes can become a response to limited access to Western capital and technology markets.

Thus, venture capital in conditions of institutional uncertainty requires a comprehensive and context-dependent approach, in which digitalization, legal stability and strategic coordination serve as the basis for the formation of an effective innovation ecosystem.

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俄罗斯企业的数字化转型与创新：俄罗斯和中国的经验

DIGITAL TRANSFORMATION AND INNOVATION IN RUSSIAN COMPANIES: THE EXPERIENCE OF RUSSIA AND CHINA

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摘要：本文探讨了俄罗斯企业数字化转型的具体特征，并将其与中国企业的做法进行了比较。作者分析了俄罗斯企业数字化变革的主要障碍和驱动因素，包括劳动力限制、基础设施差距和制度约束。特别关注俄罗斯数字化进程中缺乏战略一致性以及缺乏基于平台的商业模式。中国的经验被作为系统性方法的范例，涵盖内部数字化平台、组织结构重组、高管技能提升和积极的创新管理。基于比较分析，本文提出了适用于俄罗斯国情的实用建议。作者认为，数字化转型必须重新定义作为一种管理范式，而非纯粹的技术举措。

关键词：数字化转型；数字化成熟度；商业模式；战略管理；中国；俄罗斯；企业平台；创新；数字化战略；数字化基础设施。

Abstract. *The article examines the specific features of digital transformation in Russian companies, comparing them with practices adopted by the Chinese corporate sector. The author analyzes the key barriers and drivers of digital change in Russian organizations, including workforce limitations, infrastructural gaps, and institutional constraints. Special attention is given to the lack of strategic coherence in Russian digitalization and the absence of platform-based business models. China's experience is presented as an example of a systemic approach, encompassing internal digital platforms, restructured organizations, executive upskilling, and active innovation management. Based on the comparative analysis, the paper offers practical recommendations applicable to Russian conditions. The author concludes that digital transformation must be redefined as a managerial paradigm rather than a purely technological initiative.*

Keywords: *digital transformation; digital maturity; business model; strategic management; China; Russia; corporate platforms; innovation; digital strategy; digital infrastructure.*

In the context of global instability and shifting technological paradigms, digital transformation is becoming not just a trend, but a development imperative that

determines the future of national economies. For the Russian economy, which is undergoing deep structural restructuring, digital technologies are simultaneously becoming both a chance for a breakthrough and a test of sustainability. The scale of the challenges that Russian companies face - from sanctions pressure to technological isolation - require not an inertial response, but a systemic mobilization of resources, intellectual capital and political will.

Against this background, studying international experience is of particular importance, primarily that of the People's Republic of China, which has demonstrated a unique ability to implement large-scale digitalization at all levels of the economy: from the agro-industrial complex to high-tech industries. Over the past two decades, China has not only adapted to the challenges of the digital age, but has also formed its own model of technological sovereignty based on a comprehensive state strategy, stimulation of domestic innovation, and control over critical infrastructure.

Russia and China are two countries with different institutional logics, but similar long-term goals in the field of digital transformation: ensuring national technological independence, increasing global competitiveness and reducing dependence on Western platforms and solutions. Comparing these trajectories allows us to identify not only quantitative differences in digitalization indicators, but also qualitative differences in approaches to the formation of digital ecosystems, innovation management and building state support mechanisms.

However, despite the declared strategic guidelines, Russian practice remains largely fragmented and unbalanced. Digital transformation is unevenly implemented both across industries and regions, and in some cases is declarative in nature. There is a lack of institutional coordination, a gap between business needs and government support measures, and weak integration of digital solutions into the daily business activities of enterprises. The problem is exacerbated by personnel restrictions, technological import substitution, and an opaque regulatory environment.

Thus, the need for a systemic analysis of the digital transformation of Russian companies in comparison with the Chinese experience seems particularly relevant. In the context of global transformation, the technological landscape is becoming an arena not only of competition, but also of symbolic sovereignty, where those economies that have been able to combine innovation with institutional sustainability win. Studying the experience of China can become a kind of mirror, allowing Russian practice not only to identify its weaknesses, but also to adjust strategic priorities.

Digital transformation in Russia is developing in the context of both high ambitions and systemic limitations. Over the past five years, there has been a steady growth in interest in digital technologies from businesses, which is reflected in

the expansion of the range of solutions used - from CRM and ERP systems to the implementation of artificial intelligence technologies, the Internet of Things (IoT) and digital twins. According to the National Research University Higher School of Economics, more than 60% of large and medium-sized enterprises have declared the use of digital technologies in one form or another. [2]

However, a deep analysis shows that in most cases we are talking about partial or instrumental implementation of solutions, without integrating them into the strategic architecture of the business. As a result, formal digitalization does not lead to increased productivity, optimization of business models or real strengthening of the competitive positions of companies. This is one of the key problems - the lack of a systematic approach and digital maturity.

Industry asymmetry digital transformation continues: technologies are being most actively implemented in the banking sector, telecommunications, IT and trade, while industry, agriculture, construction and small business lag behind in both quantitative and qualitative indicators. According to the Ministry of Digital Development, in 2023, over 80% of all implemented digital solutions were in four highly competitive sectors, while most enterprises from the manufacturing industries remained at the level of “basic automation”.

Staff shortage is also a key limiting factor. Despite the active development of university programs and increased attention to digital competencies, businesses still experience an acute shortage of specialists in data analytics, AI, DevOps, cybersecurity and digital production management. Small and medium-sized enterprises, which do not have the resources to form their own IT teams and are forced to rely on external integrators, remain a particularly vulnerable segment.

It is impossible not to note the infrastructural inequality, which is manifested in a sharp gap between large cities (Moscow, St. Petersburg, Kazan, Novosibirsk) and most regional centers. The introduction of high-speed Internet, cloud solutions and data centers remain concentrated in economically developed clusters, which forms a stable digital divide.

Regulatory environment remains fragmented. Despite the adopted law on digital financial assets and the Digital Economy strategy, there are no clear rules governing the use of artificial intelligence, data and blockchain solutions in the corporate environment. This reduces predictability, limits the inflow of private investment and slows down the development of new business models. [1]

Thus, the current state of digital transformation of Russian companies can be characterized as progress with internal contradictions: despite outwardly dynamic indicators, significant institutional, personnel and infrastructure challenges remain. It is at this point that comparison with the Chinese experience becomes especially valuable as a way to identify systemic differences in approaches and possible areas of adaptation.

The digital transformation of Chinese companies is a complex and step-by-step process integrated into corporate strategy and operational management models. Unlike a number of Russian enterprises, where digitalization is often initiated by external requirements or implemented in the form of point projects, in the PRC, a systemic approach prevails at the corporate management level: digital technologies are viewed not as an auxiliary tool, but as the basis of a competitive business model.

In large Chinese corporations such as Huawei, Haier, Alibaba, BYD, Xiaomi, digital transformation is built around a clearly articulated digital strategy that covers key business areas: supply chains, customer interfaces, production facilities, human resources management, and innovation units. An example is Haier, which has implemented the “Rendanheyi” model, which involves abandoning the traditional hierarchy in favor of digitally integrated mini-teams, each of which autonomously manages a product or direction.

The central element of the Chinese corporate approach is the creation of digital platforms within the company - ERP, MES, SCM systems, supplemented by real-time analytics, AI modules, predictive maintenance tools and customer interaction interfaces. In contrast to local automation of individual processes, Chinese companies strive for end-to-end digital integration, which allows for the formation of closed value creation and delivery chains with a high degree of adaptability. [5]

Particular attention is paid to new types of industrial platforms, where one company develops digital infrastructure not only for itself, but also for partners and suppliers. For example, Alibaba Cloud and Tencent Cloud provide small and medium-sized companies with access to analytics, cloud computing, cybersecurity, and logistics services, which allows them to form sustainable and scalable business ecosystems.[4]

A characteristic feature of the digital transformation of Chinese companies is the institutionalized management of innovation. Many corporations create internal venture divisions, AI labs and R&D centers with high autonomy. For example, Baidu Apollo, within the framework of a separate innovation vertical, develops solutions in the field of unmanned transport and digital navigation, being part of the holding, but with its own development strategy.

The staffing of the transformation is solved through internal programs for digital upgrade of employees - both in IT departments and in operational services. Companies are investing massively in training middle and top management in digital competencies, including advanced analytics, agile methodologies, DevOps and data management. Thus, Huawei has implemented a digital leadership model, where each manager undergoes mandatory retraining in key areas of digital strategy.

The practice of rapid prototyping and piloting deserves special attention: new digital solutions in Chinese companies are tested in isolated areas of the business

and only then scaled up if there is a measurable effect. This “from prototype to platform” methodology helps reduce risks and accelerates the implementation of innovations without compromising operational sustainability. [3]

Thus, the digital transformation of Chinese companies is based on the principles of strategic integration of digital solutions into management and organizational structure; a platform approach to internal and external processes; priority development of competencies; high speed of implementation and scaling of innovations; close coordination with the country’s ICT ecosystem, but is not replaced by state digitalization policy.

These approaches are of interest to Russian companies, especially in terms of building internal digital platforms, personnel transformation and the use of pilot zones as a risk minimization mechanism.

The conducted research allows us to make a number of conceptual and applied conclusions reflecting the specifics of digital transformation in Russian companies against the background of the experience of the Chinese corporate sector. The author’s conclusions and recommendations are presented in Table 1.

Table 1

Author’s conclusions and recommendations for strengthening the digital transformation of Russian companies based on the experience of Chinese companies (compiled by the author)

No.	Author’s conclusion	Recommendations
1	Digitalization in Russian companies is fragmented and not integrated into business strategy	Develop comprehensive digital transformation strategies at the corporate governance level
2	Technology is used tactically, not strategically.	Integrate digital solutions into business model architecture, including manufacturing and customer processes
3	There are no internal digital platforms to ensure sustainable development	Stimulate the creation of corporate digital platforms and internal ecosystems
4	Lack of competence of managers in the field of digital solutions	Invest in training and retraining programs for executives and key specialists in digital areas
5	Lack of a culture of prototyping and piloting digital solutions	Implement rapid testing models for digital solutions through pilot projects and digital sandboxes
6	Limited connections with universities and technology developers	Build industry partnerships with IT companies and scientific and educational organizations
7	There are no universal metrics for assessing digital maturity	Develop comprehensive digital maturity KPIs that span strategy, processes, data, people and innovation practices

Thus, the digital transformation of Russian companies is at the stage of institutional development, characterized by a high level of interest, but limited depth of implementation of solutions. Analysis of corporate practices shows that most domestic organizations perceive digitalization as an instrumental modernization of individual processes, while international experience - primarily Chinese - shows the need for a strategic transformation of the entire business model.

Chinese companies have demonstrated the ability to form complex digital ecosystems, build internal platforms, invest in digital competencies, and rapidly scale innovation. These approaches are based not only on government support but also on the maturity of corporate governance and a focus on long-term technological leadership.

For Russian companies, adapting the best elements of the Chinese model can become an important area for increasing digital maturity. This requires not so much copying institutional decisions as implementing management practices: strategic digitalization, systematic work with data, personnel training, piloting innovations, and forming internal digital ecosystems.

Thus, the transition to a genuine digital transformation is possible only if the management paradigm changes, interaction with the scientific, educational and technological community is strengthened, and targeted tools for assessing and supporting digital changes within companies are developed. In this context, China's experience should not be viewed as a model for imitation, but as a source of practically applicable mechanisms and management decisions that can enhance the sustainability and competitiveness of Russian business in the context of the new technological reality.

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多元文化主义与性别：西方与中国背景下的制度性挑战
**MULTICULTURALISM AND GENDER: INSTITUTIONAL
CHALLENGES IN WESTERN AND CHINESE CONTEXTS**

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摘要：本文探讨了多元文化主义与性别平等的交叉问题，关注当多元文化政策未能纳入性别考量时所产生的制度性挑战。通过对比分析治理模式迥异但在性别结果上具有相似性的加拿大与中国两国经验，文章揭示了国家政策如何在无意中合法化群体内部的父权结构。中国案例突出反映了当前制度中的结构性缺陷，例如性别影响评估机制的缺失以及全国妇联等机构的双重职能所造成的执行困境。文章主张，若多元文化主义缺乏性别视角，可能进一步固化现有不平等结构，因此必须将性别平等作为其核心规范原则加以嵌入。文章提出包括建立性别评估机制、推动基层女性参与及明确法律保障等制度改革建议，以确保女性权利不因文化保护名义而被牺牲。

关键词：多元文化主义；性别平等；中国；加拿大；民族政策；制度改革；女性权利

Abstract. *This paper examines the intersection of multiculturalism and gender, focusing on the institutional challenges that arise when multicultural policies fail to integrate gender equality considerations. Through comparative analysis of Canada and China—two countries with contrasting governance models but similar gender-related outcomes in multicultural contexts—it identifies how state policies can inadvertently legitimize intra-community patriarchal norms. The Chinese case highlights specific structural deficiencies, including the absence of gender impact assessments and the dual mandate of institutions like the All-China Women's Federation. The paper argues that multiculturalism, if gender-blind, risks reinforcing systemic inequalities and must embed gender equality as a core normative principle. Recommendations include policy reforms in gender auditing, grassroots participation, and legal safeguards to ensure women's rights are not compromised in the name of cultural preservation.*

Keywords: *Multiculturalism, Gender Equality, China, Canada, Ethnic Policy, Institutional Reform, Women's Rights.*

Debates on multiculturalism have gained particular relevance in the era of globalization. Multiculturalism is not merely a description of cultural diversity but a normative policy framework aimed at recognizing and safeguarding the rights of various cultural groups. However, its practical implementation often overlooks the gender dimension, thereby exacerbating inequalities within minority communities (Архипова, 2019).

Although the term “multiculturalism” is most commonly associated with Western liberal democracies—where it became official policy in the 1970s—multicultural societies are also present in Africa and Asia, shaped by distinct historical and institutional trajectories (Seifi, 2015). Across diverse regions, one critical challenge persists: how can the state reconcile collective cultural rights with the protection of individual freedoms, particularly women’s rights?

Liberal interpretations of multiculturalism typically emphasize the protection of group rights. However, these rights often reflect the perspectives and interests of dominant male community members, leaving women’s voices marginalized and rendering them especially vulnerable (Bond, 2021). Ensuring the meaningful participation of women in rights negotiations is therefore vital to avoid the further entrenchment of gender inequalities.

Canada offers a telling example. While multiculturalism is enshrined in national policy and formal gender equality is legally guaranteed, minority women continue to face systemic discrimination (Toonder, 2020). When the state delegates authority over the private sphere to cultural communities, it may inadvertently legitimize patriarchal norms and practices under the guise of cultural autonomy.

While Western multiculturalism operates within a liberal democratic framework, China’s model is embedded in a socialist governance structure with centralized authority. Nonetheless, both frameworks reveal strikingly similar outcomes when gender equality is not institutionally embedded.

As a multiethnic country with 56 officially recognized ethnic groups, China has long implemented a system of regional ethnic autonomy to safeguard cultural identities in areas such as language, education, and traditional customs. However, women in some ethnic minority regions remain structurally disadvantaged. In southwestern provinces inhabited by groups such as the Bouyei, Miao, and Tibetans, early marriage, school dropout among girls, and domestic confinement persist despite significant state investment in education and poverty alleviation. Informal restrictions on women’s reproductive rights and marital autonomy—anchored in local customs or religious norms—remain resistant to change in the absence of institutionalized gender-sensitive policies.

Under President Xi Jinping, the state has promoted the concept of a “sense of community for the Chinese nation”, which prioritizes national unity and social cohesion (Xi, 2024). While ethnic policies increasingly emphasize poverty allevi-

ation and cultural integration, gender considerations remain largely marginalized. Zhu Chunkui (Zhu, 2015) notes that gender mainstreaming in China lacks systemic integration and is seldom applied across key domains of public governance. Gender impact assessments are virtually absent, and gender perspectives are rarely incorporated into national policy evaluations. These institutional gaps contribute to what may be termed “gender-neutral cultural preservation,” in which women are symbolically honored as bearers of cultural tradition but excluded as agents of social transformation—thereby reinforcing existing patriarchal hierarchies.

The case of the All-China Women’s Federation (ACWF), which oversees women’s affairs at the national level, exemplifies this tension. In ethnic minority regions, the ACWF holds a dual mandate: to preserve cultural identity while promoting gender equality. However, this dual mission, in the absence of explicit legal hierarchies between these two goals, has created a structural dilemma. Without formalized tools for gender auditing, the ACWF and similar institutions often lack operational clarity when navigating culturally sensitive gender issues. This results in ambiguity, deferral, and selective enforcement.

To address these challenges, China could benefit from targeted institutional reforms in three critical areas:

1. Introducing gender impact assessments in the formulation and implementation of all ethnic-related policies;
2. Promoting grassroots women’s political participation in both local governance and cultural institutions;
3. Defining clear legal boundaries to ensure that cultural or religious practices do not infringe upon constitutional rights to equality, education, and marital autonomy.

The Chinese case underscores a broader truth: multiculturalism—whether implemented under liberal democratic or socialist systems—can unintentionally reinforce gender hierarchies unless gender equality is explicitly embedded in its design and execution.

This structural paradox is captured by what Bond (Bond, 2021) calls the “paradox of multicultural vulnerability”: in seeking cultural inclusion, the state may end up legitimizing intra-community hierarchies that systematically disadvantage women. These harms manifest in various forms—social pressure regarding marriage, restrictions on education and employment, and enforced domestic isolation.

In contexts where women’s rights are not institutionally secured, traditional customs often conflict with universal human rights principles. In such cases, the protection of women’s rights must take precedence over the preservation of discriminatory cultural norms (Colombo, 2020). The emancipation of women is not a private concern—it is a foundational component of global human rights advocacy (Guimond & de la Sablonnière, 2014).

Immigrant women are particularly vulnerable. Barriers such as limited education, language difficulties, economic dependence, and lack of awareness of legal rights all contribute to systemic obstacles to integration (Gilani et al., 2020). These challenges are especially pronounced in Canada, where official multicultural policies often fail to acknowledge gender-based discrimination within minority groups.

Different countries adopt varied models of multicultural governance. India, for example, maintains separate legal systems based on religious affiliation, while many European nations lean toward assimilationist approaches. However, both models are susceptible to overlooking gender-specific impacts (Cha et al., 2017).

This reality underscores the urgency of integrating gender considerations into the allocation of group rights. Effective mechanisms must include women's active participation in decision-making, policy transparency, and legal guarantees of substantive equality (Жижилева, 2021).

Unconditional recognition of group rights risks entrenching discriminatory cultural practices. While multiculturalism, in theory, promotes respect for cultural difference, it must not be used to justify the erosion of fundamental individual rights. Equality and human dignity are universal principles that must apply to all individuals, regardless of their ethnic or cultural background (Попов, 2013).

Multiculturalism as a state policy must not be gender-blind. It carries a responsibility to critically assess the ways in which it may inadvertently sustain patriarchal structures. Women's rights must not be treated as cultural ornaments, but embraced as fundamental pillars of democratic and inclusive governance. Embedding gender equality within multicultural governance is not only a moral imperative—it is a necessary condition for inclusive, just, and resilient societies.

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政治进程中的数字化转型：威胁与矛盾
**DIGITAL TRANSFORMATION IN POLITICAL PROCESSES:
THREATS AND CONTRADICTIONS**

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摘要：全球数字技术可持续发展的趋势必然导致社会和政治进程的转型。数字化转型在政治层面的问题目前尤为重要，因为先进的数字技术已成为影响社会和政府各层面的有力工具。本文分析了全球化数字化对数字环境中社会安全影响的风险和威胁指标，并提出了影响国家政治结构的新机制问题。本文探讨了在分析数字环境新形态对国家政治空间的影响机制时发现的问题的相关性。作者探讨了数字化视角下国家安全和国家主权的完整性问题。

关键词：政治、数字化、政治文化、数字安全、数字主权、数字去主权、数字权力、密码无政府主义。

Abstract. *The global trend towards sustainable development of digital technologies has led to the inevitable transformation of social and political processes. The problem of digital transformation in the political aspect is currently becoming particularly relevant, since advanced digital technologies have become a powerful tool for influencing society and government at different levels. The paper analyzes the indicators of risks and threats of the impact of globalizing digitalization on the security of society in the digital environment, and also raises the issue of new mechanisms of influence on the political structure of the state. This article raises the issue of the relevance of the problems identified in the analysis of the mechanisms of influence of new metamorphoses of the digital environment on the political space of the state. The author touches upon the topic of the integrity of national security and sovereignty of the state, in the aspect of digitalization.*

Keywords: *politics, digitalization, political culture, digital security, digital sovereignty, digital desovereignty, digital power, cryptoanarchism.*

The modern world is enriched by a series of constant changes and the emergence of new trends, which, in turn, affects all social processes, creating a highly competitive struggle. The digital turn can rightfully be considered the conceptual basis for the development of modern society. Thanks to digitalization, society has acquired a modified architecture along with the transformation of political processes. It is quite obvious that new digital technologies largely contribute to increasing attention to political actors, government leaders, political events of various levels and scales, generalizing the agenda of the socio-political spectrum. In scientific discourse, research topics devoted to the risks and consequences of digitalization for society and the state have been insufficiently studied, which is due to the novelty of this phenomenon. Under the influence of global digitalization processes, there is also a transformation in the political space of both the state and the world order. It should be noted that digitalization by its nature has an ambivalent character, which determines its ambiguous manifestations in all socio-political processes of the state, causing both positive and negative consequences. According to G.P. According to Shchedrov, digitalization in politics, like any political process, is characterized by a certain dynamic, ensuring the development and stable functioning of the political system in changing conditions. For the effective use of digital technologies in politics, the researcher notes the importance of further development of the regulatory framework, technological infrastructure and public control mechanism [9, p. 35].

Posting political information on Internet resources; digitization of archival and historically important documents, posting thematic literature in the public domain; blogs of political experts, accounts of members of the Government in social networks - all this is the main mechanisms of influence in the socio-political environment.

Speaking about the political effects of the digitalization process, it is necessary to take into account the following. Today, a kind of convergence of politics and the digital environment is taking place. Political actors, taking advantage of digital communications, are conducting a project to obtain public support and implement a strategic action plan aimed at achieving their goals within the framework of competition [7, p. 86].

Public information from political leaders, as a rule, always causes a powerful public resonance. The effect is naturally enhanced in the case of targeted information with a political agenda and is achieved by dissemination via digital communication. And today, it is already difficult to imagine that it can be any other way. In the political sphere of activity, the digital environment has given public diplomacy a new form of its historical development - digital diplomacy. In this case, digitalization, under certain conditions, acts as a deterrent aimed at limiting or preventing secret diplomacy, various kinds of discrimination, manipulation and other negative phenomena in the international sphere.

With the development of the digital environment, characterized by the ability to freely and conveniently possess and exchange information, the methods of interaction and influence continue to transform in parallel. It is impossible to lose sight of such an aspect of the influence of digitalization as the digitization of historical documents from the Great Patriotic War. Documentary materials digitized and posted on information resources provide free access to the society to the information that, due to various circumstances, was previously impossible to make public. This process, on the eve of the 80th anniversary of the Victory over the fascist regime, caused a special resonance in society, both within the Russian state and beyond its borders. The opportunity to make public historical facts, folk truth, ignored for many decades in a row, is, in our opinion, an effective tool in the implementation of state policy against modern forms of escalation of Nazism, racism, xenophobia, etc. It should be noted that in addition to declassifying documents and making them public, it has become appropriate to include comments from political experts, historians, sociologists, in a word, those whose names are authoritative and well-known in modern society.

Taking into account the above, we believe that today digital communication is an effective means of regulating political processes (both within the state and internationally), which can rightfully be considered a powerful strategic tool, both at the stage of preventive measures to maintain national security of the state, and in eliminating real problems.

In the modern digital world, the presence of a virtually unlimited number of information exchanges on the Internet forms a kind of system of digital power, which is represented by a complex system of resources structured around the production and exchange of digital information, as well as control over it. Digital power is gradually transforming into a ruling force, i.e. superpower, which cannot be completely limited to control and supervision of all existing structural levels of cyberspace. Along with this, another component of the digitalization process is obvious, as the problem of digital sovereignty. Today, we are seeing a persistent trend of how digitalization serves as a kind of indicator that determines the status of a state in the international arena, and the digital space, at the same time, has become a kind of field for geopolitical processes, so the scientific community has increased attention to the problem of digital sovereignty. To date, there is no unambiguous approach to the interpretation of this concept in the scientific literature, so several different approaches to its definition have developed, since digital sovereignty is inherently dynamic. This is largely due to political contradictions between countries, their differences in political regimes, as well as culture and advanced technologies. Analysis of studies on the impact of digital technologies on the socio-political sphere showed mixed interest in this topic. This conclusion can be made if we take into account the research of both foreign researchers (T.

Adorno, M. Horkheimer, G. Marcuse, G. Schiller, J. Habermas, etc.) and domestic ones (G.P. Bakuleva, V.V. Bukharin, E.L. Vartanova, D.V. Vinnik, V.L. Inozemtseva, A.D. Trakhtenberg, I.S. Melyukhina, A.A. Chernova, A.V. Chugunova, etc.), who, covering the problems of digitalization, focus on the analysis of digital security and digital sovereignty. It should be noted that the Tunis Agenda for the Information Society, adopted in 2005 at the second stage of the World Summit, at the political level on information society issues, called on states to pay due attention to information and communication technologies in their national development strategies. Along with this, a number of political powers were provided for to resolve issues related to the Internet, as an absolute sovereign right of states, which served as the first step towards attributing state sovereignty to the global digital space. S.V. Shitkov focuses on the specific features of digital technologies that do not allow extrapolating the category of sovereignty from the real to the virtual space. Among such features, he includes the transboundary nature of information and data flows, the high role of private companies and individual users in creating content. He sees the difficulty of establishing the boundaries of state jurisdiction in relation to the digital sovereignty of states and believes that "... when determining the essential characteristics of the concept of digital sovereignty in international relations and international law, a number of other features should be taken into account" [8].

The above-mentioned researcher defines digital sovereignty as "the ability of a state to assert its independent governance and ensure compliance with its own laws and regulations in the digital space against the backdrop of globalization and the interconnectedness of the digital environment" [8].

We see the difference between digital sovereignty and territorial sovereignty, first of all, in the absence of clearly defined boundaries of the digital space with its high-speed dynamics of expansion of these boundaries; the impossibility of total control over digital resources by government bodies and the prosecution of violators in the event of unauthorized use of information. Of no small significance are also completely different socio-political rules and cultural traditions of the digital space, where it is not possible to verify the identification and authenticity of an individual at all levels of interaction. Mostly, we observe the triumph of fakes, deepfakes, copies and plagiarism, which contributes to the intensity of the already difficult political situation of the world order.

However, the determination of digital means has a number of obvious, and in some places unpredictable consequences. Undoubtedly, we have already begun to observe how everything "digital" has entailed changes in the social world order already now.

The scientific world cautiously mentions that in addition to the advantages that digital technologies bring, one should not lose sight of a number of risks and

threats that are underestimated by society. In particular, this applies to the risks of unauthorized circulation of financial resources, collection of private information, total digital surveillance, violation of personal space and transfer of personal data to third parties, fraud, etc. However, it should be noted that this is not an exhaustive list of negative phenomena of digitalization. Thus, one of the most alarming moments is the active attempts at digital desovereignization in the economic sphere of the state, which can already be observed today.

Newly introduced digital cryptocurrencies, such as Bitcoin, provide owners with the opportunity to carry out financial and economic activities that are not controlled and regulated by the state. Thus, cryptocurrencies Bitcoin and its alternatives Monero, Zcash, Beam claim to replace national fiat currencies, which will naturally lead to the total exclusion of the state's rights to control and regulate the national economic space. Along with this, it is impossible not to note the fact of the emergence of such a tricky tool as decentralization of finance (DeFi system) - the mass withdrawal of funds from the national monetary and financial system into the sphere of individual horizontal interactions, the so-called smart contracts. Along with this, there is an emergence of tools and services (distributed domain name services Ethereum Naming Service, Unstoppable Domains, Handshake; decentralized social media services Minds, Hive, Golos, Steem, Commun, All.me, Indorse, etc.; Web 3.0 services Blockstack, Filecoin, Graphite Docs, etc., with the help of which information is distributed and stored in encrypted form on the devices of Internet users), allowing the mass user to bypass the control and regulatory rules of specialized and special services responsible for ensuring the security of national segments of the digital space. According to S.V. Volodenkov, digital cryptocurrency is essentially an effective mechanism for promoting a relatively new direction in the ideology of crypto-anarchism [4, p. 4].

Within the framework of crypto-anarchism, it is possible to provide citizens with alternative means of payment, but at the same time, the practice of external financing of supranational and non-governmental corporations is expanding. The intentions of such actions are not the best, for example, it can be an impact on the country's information policy, disruption of information infrastructures, unauthorized data collection, which creates a digital dilemma of public security [2]. Thus, the digitalization of the financial and monetary system of the state in the face of a serious threat poses to the state the possibility of losing control and regulation of the domestic economic sphere, as well as the invasion of external political actors representing transnational interests in opposition to the good of the state.

It should be noted that in 2022, the beginning of the SMO forced the policy regarding digital protection in Russia. Thus, in view of the spread of unauthorized accusations, fake news, cyberbullying against Russians and threats to the national security of our state, a number of international news resources (BBC News,

Deutsche Welle and RFE / RL), video hosting sites (YouTube), social publics (Instagram, Facebook) were systematically blocked by a court decision, recognizing them as “extremist”.

Given the above, it is impossible not to be puzzled by the following question: “How, in the 21st century, is society, having reached such a high level of technological development, intellectual research, taking advantage of digital technologies, capable of such illegal actions as inciting ethnic hatred?”

On this account, V.D. Isaev believes that in the digital environment, a person presents himself as “alienated and depersonalized”, he is characterized by a state of absurdity and recklessness of existence in reality [5].

Taking into account the above, we consider it necessary to emphasize the problematic nature of the legal regulation of the digitalization process. In this regard, the state faces complex tasks, which to ignore further means voluntarily handing over the reins of government to transnational corporations.

In order to implement digital security, there is an urgent need for an early legal definition of the “concept of digital sovereignty”, which will provide, within the framework of current legislation, user security standards, control over information resources, granting jurisdictional characteristics, and acquiring a certain “mechanism of checks and balances”.

At the same time, I would like to touch upon another aspect of the digitalization process - digital inequality, which is due to the lag of some states (for example, the states of the African continent) from digital progress, the so-called “Digital inclusion”. In this case, digitalization at the state level is an appropriate way to overcome inequality, with the prospect of mastering one’s own share in the global digital infrastructure, becoming an equal participant.

In this regard, in order to overcome the digital divide and provide the African population with the necessary level of digital literacy, the African Union has approved a strategy for the electronic development of Africa until 2030, within the framework of which a partnership is envisaged with a number of states developed in this industry, including the Russian Federation.

Thus, the rapidly developing digital environment has significantly changed and continues to change the configuration of political processes and the way of life of society as a whole, both at the individual and global levels. Of course, taking into account the above, we understand that this process has dual consequences: on the one hand, new advantages and prospects appear, and on the other, digital destruction and metamorphoses inevitably cause threatening effects on society and the state as a whole. That is why, in the conditions of digital globalization of the world space, the modern state faces an urgent need to define a targeted concept that will provide coordinates to overcome or minimize threats and destructive risks at all levels of interaction. These circumstances put forward compelling arguments about the need to update research of a scientific and empirical nature in the future.

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从俄罗斯联邦和中国的比较教育学角度对未来音乐教师掌握组织儿童音乐和器乐活动技术的过程进行建模

**MODELING OF THE PROCESS OF MASTERING BY FUTURE
MUSIC TEACHERS OF TECHNOLOGIES FOR ORGANIZING
MUSICAL AND INSTRUMENTAL ACTIVITIES OF CHILDREN IN
THE ASPECT OF COMPARATIVE PEDAGOGY OF THE RUSSIAN
FEDERATION AND CHINA**

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注释。本文介绍了为检验研究假设而进行的教学实验的各个阶段——确定阶段、形成阶段和验证阶段，该实验表明，在俄罗斯大学学习的中国学生在掌握组织中俄比较教育学视角下小学生音乐和器乐活动的方法的过程中，如果满足一些教学条件，将是有效的：俄罗斯和中国教育界都承认需要更新音乐教育的比较教育学，这可以从两个方面得到证明：中国作为未来音乐教师的居住国，其教育政策的要求维护中国民族文化的独特性和价值，这是中国社会稳定发展的必要因素；俄罗斯联邦作为学习国，与联邦国家高等教育标准以及联邦国家小学普通教育和基础普通教育标准相关，并要求培养在俄罗斯大学顺利完成教育实践所必需的能力；在中国和俄罗斯联邦音乐教育比较教育学的视角下，探讨儿童音乐器乐活动组织中的多层次技术方法，其结合了概念层面、项目层面和程序层面。

关键词：比较教育学、俄罗斯、中国、小学、音乐器乐活动、技术、概念层面、项目层面、程序层面。

Annotation. *The article presents a description of the stages of a pedagogical experiment - ascertaining, formative and verification for testing the research hypothesis, which suggests that the process of mastering approaches to organizing musical and instrumental activities of primary school students in the aspect of comparative pedagogy of Russia and China by Chinese students studying in Russian universities will be effective if a number of pedagogical conditions are met: acceptance by the pedagogical community of Russia and China of the need to update comparative pedagogy of music education, which can be justified from two positions: China, as a country of residence of future music teachers, the demands of whose educational policy defend the uniqueness and value of the national culture of China, as a necessary factor in the stable development of Chinese society; the*

Russian Federation, as a country of study, which is associated with the Federal State Educational Standard of Higher Education, as well as the Federal State Educational Standard of Primary General Education and Basic General Education and requires the formation of competencies necessary for successful completion of pedagogical practice in Russian universities; multi-level technological approach to the organization of musical and instrumental activities of children in the aspect of comparative pedagogy of music education in China and the Russian Federation as a combination of: conceptual; project; procedural levels

Keywords: *comparative pedagogy, Russia, China, primary school, musical and instrumental activities, technologies, conceptual, project, procedural levels.*

Introduction to the problem

The growing relationship between Russia and China in the context of expanding contacts, export and import of ideas of musical education beyond the national borders of the above-mentioned states naturally determines the increasing interest in international comparisons. In this regard, a special direction of scientific research has developed in the pedagogy of musical education - comparative studies, which allows in the sphere of musical and musical-pedagogical education to identify the relationship of general trends and national specifics to the technologies of musical education, training, development of children in various types of creativity. Meanwhile, the contradiction between: - the demand for comparative research in the field of musical and musical-pedagogical education of Russia and China, and the absence of such in the field of musical-instrumental activity and preparation for its organization in universities of the above-mentioned countries is also obvious; - training of Chinese students in Russian universities for the purpose of preparing teaching staff for educational institutions in the PRC and the absence in their professional training of a developed course that would allow future music teachers in China to master approaches to organizing musical and instrumental activities of students in the classroom in the context of comparative pedagogy of music education in the country of study and the country of residence.

Methods

The relevance determined the purpose of the study: theoretical substantiation and testing of a model of a technological approach to the development by Chinese students studying in Russian universities of the organization of musical and instrumental activities of primary school students in the context of comparative pedagogy of Russia and China.

The hypothesis, developed theoretically, was tested at the Faculty of Musical Arts of Moscow State Pedagogical University and consisted of three stages - ascertaining, forming and testing. Two groups took part in the experiment - experimental and control. The groups were equal in number of students, each of them

included 25 people. The control group traditionally studied, mastering approaches to the organization of musical and instrumental activities in general education of the country of study - the Russian Federation.

During the ascertaining stage, the following methods were used in combination: pedagogical observation; conversation; testing; questionnaire.

The interview method included questions about musical instruments used in Russian Federation and China in music lessons at school. For greater motivation, we used video clips <https://youtu.be/W7kKOOuAt5Y>, <https://youtu.be/7F3PZiT-WJkE>. The interview was supplemented by a questionnaire - written answers to developed questions.

Questionnaire No. 1.

1. The first mentions of music in China date back to the Qin era (2nd century BC). The pleasure of listening to music was praised by Confucius. The great sage himself played musical instruments, first and foremost, of course, the “king of all instruments” – the guqin. Many forms of ensemble music had already formed back then. For example, the most famous duet of silk and bamboo (丝竹 *si zhu*). Why did the duet have such a name?

2. What do you know about the well-known Russian method of teaching children to play the flute – the method of A.I. Konch (Figure No. 1)?

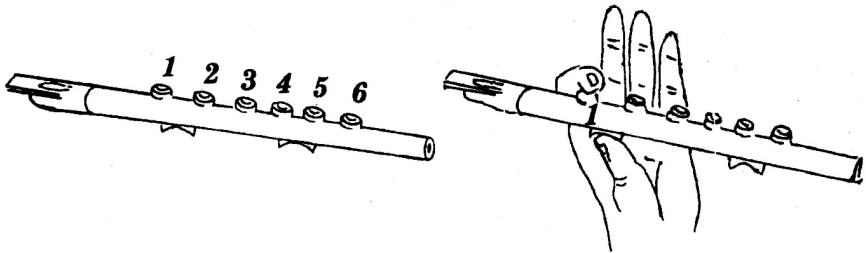


Figure 1.

To identify the obtained results, we developed criteria of high, medium and low levels. The following indicators of the formation of professional competencies for mastering by future music teachers of the PRC studying in universities of the Russian Federation, the methods of organizing musical and instrumental activities of primary school students in the aspect of comparative pedagogy of the country of residence and the country of study were considered: knowledge of instruments, proficiency in playing methods of musical instruments that are used in general music education of the Russian Federation and the PRC, the ability to develop scores for collective music-making. The results showed the absence of high indicators, the presence of low and medium indicators of the formation of profes-

sional competencies for mastering by future music teachers of the PRC studying in universities of the Russian Federation, the methods of organizing musical and instrumental activities of primary school students in the aspect of comparative pedagogy of the country of residence and the country of study, both in the control and experimental groups.

Analyzing the obtained results, it is easy to explain the prevalence of average and low indicators by the lack of students' readiness to consider the musical and instrumental activities of primary school students in the aspect of comparative pedagogy of the country of residence and the country of study due to the lack of necessary experience and formed ideas. At the formative stage of the experiment, students mastered the methods of Russian authors (A.I. Konch, I.G. Lapteva, T.E. Tyutyunnikova), and also practiced playing elementary musical instruments (metallophones, triangle, rattles, etc.) and traditional musical instruments of the PRC. For this purpose, we developed an electronic educational resource that allows you to master the algorithm for learning to play the xiao flute, xun ocarina, pipa, yaogu.

Also, in the conditions of the formative stage, students mastered approaches to organizing musical and instrumental music-making in general music education, playing music on elementary musical instruments of the PRC and the Russian Federation [1], [2], including didactic equipment for the process of organizing this type of activity in a lesson in primary school (Figure No. 2).

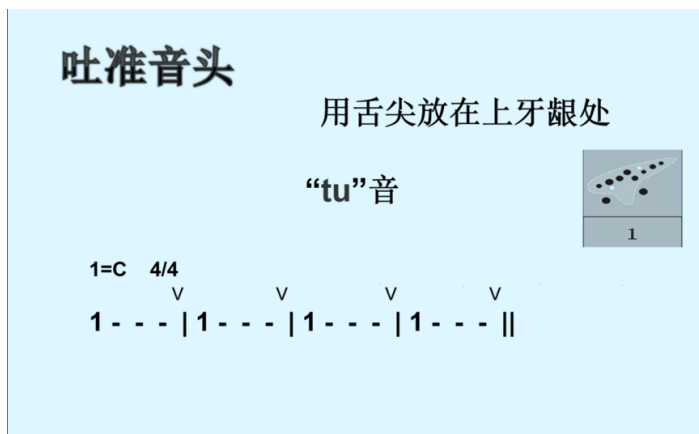


Figure 2.

During the classes, students were taught how important it is to develop children's understanding of conductor's gestures so that in the future the students would learn to play according to the conductor's hand. During the work on the

scores, the issues of children's mastery of musical notation were discussed in order to learn to play according to orchestral parts.

In performing the scores, we strived for rhythmic precision, unity of strokes, correct phrasing, expressive dynamics, and even tempo. To achieve this, the orchestra members had to learn to play by listening to each other, monitoring the sound of the part and the orchestra as a whole with their ears.

As an example of didactic equipment for the formative stage of experimental work, we present a score learned in classes with students (Figure No. 3).

Y. KUKUZENKO
"To my aunt, in Saratov"

Fast 120 



Triangle N $\frac{2}{4}$ 

Spoons $\frac{2}{4}$ 

Der. box $\frac{2}{4}$ 

Ratchet $\frac{2}{4}$ 

Glockenspiel $\frac{2}{4}$ 

Tambourine $\frac{2}{4}$ 

F-P. $\frac{2}{4}$ 

Synthesizer $\frac{2}{4}$ 

Bells $\frac{2}{4}$ 

Figure 3.

Thus, at the formative stage of the experimental work, we tested the model of the multi-level technological approach as a structure that incorporates conceptual, design and procedural components (Figure No. 4).

At the testing stage, we again used the methods of pedagogical observation, conversation, and questionnaires.

Comparing the results of the verification stage, it should be noted that there were no low indicators and the prevalence of high levels in the experimental group, while in the control group the prevailing indicators were average levels.

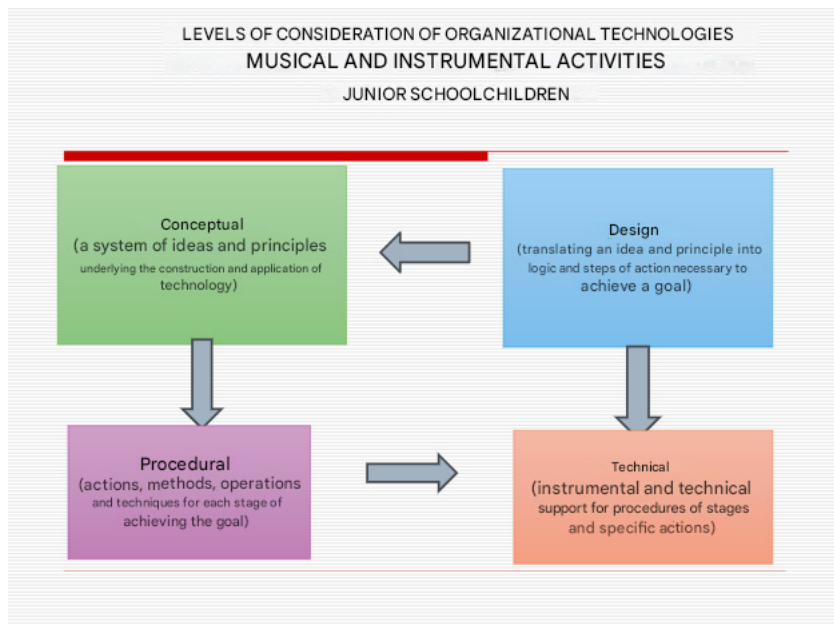


Figure 4.

The obtained results allow us to assert that the model of mastering approaches to organizing musical and instrumental activities of primary school students in the aspect of comparative pedagogy of Russia and China by Chinese students studying in Russian universities will be effective if a number of pedagogical conditions are met: acceptance by the pedagogical community of Russia and China of the need to update comparative pedagogy of music education, which can be justified from two positions: China, as the country of residence of future music teachers, the demands of whose educational policy defend the uniqueness and value of the national culture of China, as a necessary factor in the stable development of Chinese society; the Russian Federation, as a country of study, which is associated with the Federal State Educational Standard of Higher Education, as well as the Federal State Educational Standard of Primary General Education and General Education and requires the formation of competencies necessary for successful completion of pedagogical practice in Russian universities; multi-level techno-

logical approach to organizing musical and instrumental activities of children in the aspect of comparative pedagogy of music education of China and the Russian Federation as a combination of: conceptual; project; procedural levels.

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中国式现代化背景下的体育教育国际化

INTERNATIONALISATION OF SPORTS EDUCATION IN THE CONTEXT OF MODERNISATION WITH CHINESE SPECIFICITY

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摘要： 本文旨在探讨中华人民共和国体育文化在现代化进程中的发展特征，聚焦于其与国际合作的紧密互动。研究认为，在21世纪中国高等教育国际化深入推进的背景下，传统体育文化将日益凸显其关键作用。

关键词： 传统体育文化；教育国际化；现代化；中国

Abstract. *This article is devoted to the study of the peculiarities of physical culture development in the People's Republic of China in the context of its socio-technological modernisation, implemented in the conditions of close international cooperation. It is concluded that traditional physical culture plays an increasingly important role in the internationalisation of Chinese higher education in the 21st century.*

Keywords: *traditional physical culture, internationalisation of education, modernisation, China.*

Introduction

At the turn of the 19th and 20th centuries, physical culture took root in the Chinese education system through foreign borrowing, as one of the areas of the country's socio-technological modernization. This occurred against the backdrop of a rapidly changing geopolitical situation in the world, associated, among other things, with the strengthening of global decolonization. As a result, in the second half of the 20th century, the leading powers significantly reduced the intensity of military influence, replacing it with humanitarian instruments of diplomacy, such as education, language and culture. Physical culture has undoubtedly become one of the instruments of cultural diplomacy [1].

With the majority of exclusive technologies and know-how, the metropolitan countries retained a global influence on their former colonies. China was no ex-

ception and in its development often turned to certain foreign practices, including in the field of sports and physical culture [2]. This article is devoted to the study of the features of the development of physical culture in the PRC in the context of the international component of the education sphere and is intended to answer the following questions: 1) How are physical culture and modernization interrelated in the PRC? 2) What is the international component of physical culture in modern China, or in other words, how is the internationalization of higher sports education possible?

Literature Review

Over the past 100 years, the conceptual justification of modernization has been one of the most important topics in Chinese humanitarian science. During this time, the interpretation of this concept has undergone significant changes. Despite the fact that this term first appeared in British sources in the 1880s [3], it was consolidated in the Chinese context much later, thanks to Lukesh's book "New Turkey" [4], where modernization is equated with Westernization.

After the victory of the Communist Party and the creation of the PRC in the middle of the 20th century, modernization in China began to be viewed within the framework of Marxism, as an inexorable process on the path to communism [5]. Later, the classical theory of modernization (CMT) dominated, based on the dichotomy of "tradition - modernity" [6]. CMT was understood in a comprehensive manner, in the spiritual sense it was realized through secularization, in the economic sense - through industrialization, which together should have ensured the formation of a Western way of life in a modernizing society [7]. For example, the famous educator Gu Mingyuan defined modernization as a linear process, directed in its development from agriculture to an information society through the stage of industrial production [8]. In general, a linear view of social development became characteristic of Chinese philosophy, which began to consider Chinese culture in terms of tradition, while Western culture - innovations [9]. In the 21st century, CMT is increasingly subject to criticism [10]. In this context, the thinker Xu Jilin notes the spread of cultural conservatism in the Chinese academic community, which is increasingly oriented toward the dialectical opposition of the Confucian tradition and the values of the European Enlightenment [11]. At this time, thanks to the works of S. Eisenstadt and P. Wagner, the paradigm of multiple modernities (PMM) emerged. Unlike CTM, MPM defines modernity as an unpredictable process of change that society undergoes [12; 13], and therefore modernization is not identified with Westernization. Thanks to the efforts of Luo Rongku, Li Shitao, Fan Zhaohui, Lin Jiuren [14; 15; 16; 17], MPM quickly spread in the PRC and already such scholars as Xue Antai, Xia Zhenkun, Chen Shimin, Li Qingxia began to consider the local cultural context as the basis of any modernity [18; 19; 20; 21]. Physical Culture as a Direction of Modernization

The need to modernize China became obvious at the turn of the 19th and 20th centuries, when the country's military and diplomatic failures worsened due to its socio-economic backwardness. At that time, the goal of modernization was seen as the need to stop further national degradation and outline a new path for China's future development. The symbol of new ideas was the magazine "New Youth", which united the leading Chinese thinkers of that time: Chen Duxiu, Hu Shi, Gao Yihan, Lu Xun, Li Dazhao.

With the emergence of the PRC and the change in the country's development course towards building socialism in the 1950s, the course towards modernization intensified. Following the example of the USSR, traditional culture was then seen as a dangerous relic of the past on the path of total renewal of society, trying to achieve communism. China consistently adopted the main practices in the field of culture and production from the USSR, and physical culture was no exception. Mass sports in the USSR were completely in the paradigm of the country's militarization and were oriented towards the GTO (readiness for labor and defense) complex, the purpose of which was to prepare a military reserve for the rapid deployment of armies during war. [22, p. 398]. At the same time, Olympism, popular in the West, was rejected as a movement ideologically incompatible with the communist system. In the 1960s, relations between the socialist countries deteriorated sharply, but the PRC not only did not reject the established Soviet practices, but even strengthened them, extending them to all Chinese education [23]. Later, as part of the opening-up reforms, the PRC nevertheless joined the Olympic movement, but this did not affect the overall militarization of mass sports and sports education in China. In the described conditions, not only was there no place for traditional physical culture, but it was considered an obstacle to both directions of sports education development.

A little later, against the backdrop of increased cooperation between the PRC and Western countries and the collapse of the USSR, Joseph Nye's concept of soft power became popular in the country [24]. On the one hand, success in elite sports, especially Olympic medals, significantly increases the country's prestige and its recognition in the international arena [25]. On the other hand, Chinese martial arts become an important part of mass culture in the West. Through cinema, they gain popularity among the general population and turn into an important part of mass physical culture, which also contributes to increased public interest in China.

Despite the global demand and popularity of Chinese martial arts, their integration into educational structures remains low. Despite government efforts to stimulate interest in traditional sports, wushu (a non-Olympic sport) has not yet become part of the curriculum [26]. Martial arts, as the most popular branch of Chinese traditional physical culture, are still of little demand in Chinese sports education, while less popular traditional games and disciplines remain virtually forgotten.

Internationalization of Sports Education

The modern understanding of global education distinguishes the processes of globalization and internationalization as two different formats for implementing international cooperation. Globalization is oriented toward universalization, internationalization toward individualization [27]. Internationalization means mutual study and interaction of national elements within the framework of international educational cooperation [28].

The described approach is reflected in modern Chinese social philosophy, which believes that the internationalization of higher sports education in China should be oriented, among other things, toward promoting traditional physical culture, and not regarding it as something “foreign”. While traditional physical education can become a communication bridge between China and other countries, focusing exclusively on high-performance sports may negatively affect the comprehensiveness and universality of higher sports education.

The involvement of foreign students in the development of traditional physical education has become an important task for Chinese universities. This focus is due to the imbalance of the previous course of development of sports education, which was mainly focused on high-performance sports. On the one hand, this contributed to filling the system of higher sports education in China with world-class specialists with experience in participating in the Olympic Games, on the other hand, the internationalization of Chinese sports has stalled, and sports universities have not become a bridge between different cultures and traditions.

In this context, traditional physical education can become a link between China and other countries, especially developing countries. For example, Beijing and Shanghai Sports Universities train specialists in traditional sports for free in international programs to promote the implementation of Chinese projects such as the Community of Shared Destiny, the Belt and Road, the Confucius Institutes, etc. [29].

Traditional physical culture is becoming increasingly important in promoting regional cooperation and mutual understanding among partner countries that are members of important international organizations. As part of strengthening the connectivity of ASEAN countries, Guangxi University promotes traditional sports competitions [30]. Within the SCO, Xinjiang University is implementing a similar initiative by organizing traditional culture festivals [31].

Traditional physical culture is becoming an important part of mass sports and entertainment, such as the Dragon Boat Racing Championship [32]. Such events also contribute to better immersion in Chinese culture and are promoted as optional subjects in the study of the Chinese language at Beijing Normal University, Northeast Normal University, etc. [33].

Conclusion

Sports universities are expanding traditional sports culture programs for international students, as well as their participation in international initiatives in this area. This reflects the goals of equal dialogue between partners at the international level. Against the background of these processes, there may be a renaissance of traditional sports culture as a link between China and its partners in the field of education. In this regard, there is a need to adjust the concept of modernization and space opens up for the theoretical development of a modernization program with Chinese characteristics.

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训练课程、体育工作、相互关系和协同作用

TRAINING SESSIONS, SPORTS WORK, THEIR INTERRELATION, SYNERGY

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摘要：在学生空闲时间严重匮乏的情况下，训练本身的复杂性显著提升了大学体育教育和运动工作的重要性。我们讨论的是教育活动和体育工作之间的相互关联、相互依存和相互投入。当然，这需要借助现代科技，以提升参与者的兴趣和积极性，并促进组织者的工作。但正如大家所知，新事物往往被遗忘。本文探讨了在学院斯巴达基运动会框架下，在“体育文化与运动”学科和“运动与户外游戏”学科的训练课程中直接举办某些运动项目的函授比赛。

关键词：训练课程、体育工作、体育比赛、函授课程、出勤率、成绩记录、动机、课堂兴趣。

Abstract. *In conditions of an acute shortage of free time among students, the complexity of the training itself significantly increases the role of physical education and sports work at the University. We are talking about the interrelationship, interdependence, and mutual investment of educational activities and sports work. Of course, this should be based on modern technologies, which increases the interest and motivation of those involved and facilitates the work of the organizers. But, as you know, the new is the well-forgotten old. The article discusses the holding of correspondence competitions within the framework of the Spartakiad of the Institute in some sports directly in the training sessions in the discipline “Physical culture and sports”, as well as in the discipline “Sports and outdoor games”.*

Keywords: *training sessions, sports work, sports games, correspondence courses, attendance, recorded results, motivation, interest in classes.*

Relevance of the study. The specifics of the university and the composition of the students indicated the need for non-standard approaches that involve building an adequate motor model of physical education and sports activities that optimally meets the requirements for satisfying the motor interests and needs of students.

Purpose of the study. Involving students in sports work, increasing their interest in physical education and sports classes, sports and outdoor games.

Organization of the study. For two years, during physical education classes, the interests and preferences of students in choosing a particular sport, type of motor activity in study groups were studied. Constant monitoring was carried out, testing (pilot projects) and feedback collection were used. As a result, the Spartakiads of the Medical and Social Institute were held twice. Comparative results of the Spartakiads and attendance of classes (for some indicators) are given below.

Subjects. The study involved 1st, 2nd and 3rd year students.

Research methods. Comparative analysis.

Research results.

Attendance of classes (Table 1). The table shows the figures - average absence of person-hours per group by semesters of study. And the number of groups participating in the study.

Table 1.

Course/ Semester	Fall 2023-2024 academic year	Spring 2023-2024 academic year	Fall 2024-2025 academic year	Spring 2024-2025 academic year
1st year	109 (6 groups)	178.3 (6 groups)	77.1 (6 groups)	55.5 (4 groups)
2nd year	230 (3 groups)	260.3 (3 groups)	531.3 (3 groups)	627.6 (3 groups)
3rd year	281.5 (10 groups)	347.3 (3 groups)	343.7 (4 groups)	250.2 (4 groups)
Total average per semester	212 (21 groups)	231.6 (13 groups)	202 (17 groups)	207 (15 groups)

Sports work (Table 2). The table shows the numbers - the number of recorded results by sports.

Table 2.

Sports/year	Spartakiad «Spring-2024»	Spartakiad «Spring 2025»	The advisability of further implementation
All-around GTO	146d + 65m = 211	143d+69m=212	+
Kettlebell lifting	44d + 37m = 81	24d+22m=46	+
Table tennis	Only the stage in the study groups was held	22d+26m=48	+
Badminton	Only the stage in the study groups was held	34	+

Darts «Points»	-	159	+
Darts «Sector 20»	-	91	+?
Gorodki	-	69	+?
Chess	-	20	+?
Mini-lapta	-	In testing mode	?
Ultimate/Frisbee	-	In testing mode	?
Volleyball	Only the stage in study groups was held	In testing mode	? Possible 2x2 (m+d), no limit on the number of teams from the group
Streetball	Only the stage in study groups was held	In testing mode	? Possible 2x2 (m+d), no limit on the number of teams from the group
Total intergroup results	292	679	+

Discussion of the research results. It should be noted that the problematic issues of the St. Petersburg MSI are very similar to those of REAVIZ University [1]. High demands on the level of students' knowledge are associated with significant workloads outside the walls of the Institute. Most students already work in their specialty, have managed to start families, which is certainly good, but the workload on the student increases many times over. Considering that this is shift work, often at night, it is necessary to adjust the physical load during classes. The load in such cases should be minimized, and the classes should be more restorative in nature. Of course, taking into account the individual characteristics and needs of the student. Someone needs a calm, fairly long, uniform workout to relieve nervous tension, someone needs to stretch thoroughly, someone prefers a significant strength load, especially for strength endurance. So, exercises with kettlebells for 30 minutes or a whole hour, without placing the projectile on the platform, according to many involved in this sport, help best restore mental balance and put yourself in order. Everything is very individual, especially since the student body, which is very diverse in age and physical standards, is also very multinational. Which imposes significant, additional requirements and adjustments to the structure of classes, the choice of sports for inclusion in the Institute Spartakiads. Here it should be understood that based on national diversity, possible restrictions, preferences in the choice of exercises and types of physical activity associated with religious beliefs, each group has its own program, which, however, must necessarily maintain a common focus. It should be noted that the more diverse the student body, the more interesting the classes. A kind of synergy arises, provided that students are gradually given a little more independence in the classroom, allowed to open up, and not forced to work "under duress". Returning to the results given in the tables, the Institute has shown positive dynamics in the areas of work

under consideration, attendance at classes is growing and student involvement in sports work is growing. In general, the dynamics are positive. A sharp drop in 3-4 semesters of study requires adjustments in the educational process, certain actions on the part of curators of study groups and teaching staff. Of course, the lack of credits at the end of 3, 4, 5 semesters of study has an effect.

Conclusions: Positive dynamics in attendance of classes and involvement of students in sports work indicates that it is necessary to continue to support the emerging trend, thoughtfully, carefully, gradually, but steadily, all as a well-organized training process suggests [2-8].

Individual work with students is of great, perhaps key importance.

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在教学过程中使用 ChatGPT: 利与弊
**USING CHATGPT IN TEACHING-LEARNING PROCESS: PROS
AND CONS**

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摘要: 本文旨在深入探讨在教学过程中使用 ChatGPT 的利弊, 阐明这一创新工具如何提升教育成果, 同时强调谨慎行事和批判性参与的必要性。文中回顾了人工智能的发展历史, 包括该领域的重大发现, 探讨了人工智能 (AI) 的理论问题及其在教学过程中的作用。文章展示了一些实用的人工智能教育平台及其具体特点。通过研究这些方面, 我们希望为教育工作者提供一个平衡的视角, 帮助他们在教学实践中融入人工智能。作者强调, 创建专业的提示对于在教学过程中使用 ChatGPT 至关重要。ChatGPT 在教学过程中的重要性在于它能够使用自然语言与人类进行对话。

关键词: 人工智能 (AI)、ChatGPT、教学过程、人工智能教育平台、提示、虚拟语音助手。

Abstract. *This article aims to delve into the pros and cons of using ChatGPT in the teaching-learning process, shedding light on how this innovative tool can enhance educational outcomes while also highlighting the need for caution and critical engagement. The history of the AI development is described including great discoveries in this area. The theoretical issues of artificial intelligence (AI) and its role in the teaching-learning process are viewed. The article shows practical AI educational platforms with detailed characteristics. By examining these facets, we hope to provide educators with a balanced perspective that can inform their approach to integrating AI in their teaching practices. The author underlines the high importance of the ability of creating professional prompts for using ChatGPT in the teaching-learning process. The importance of ChatGPT in the teaching-learning process is great due to the ability of Virtual speech assistant to maintain the dialogue with a human on the natural language.*

Keywords: *artificial intelligence (AI), ChatGPT, teaching-learning process, AI educational platforms, prompts, Virtual speech assistant.*

1. Introduction

Modern society claims making communication processes more convenient and faster. This refers to the question of the application of the Internet in our life deeper via artificial intelligence and virtual speech assistants. Such assistants can help to build the process of communication between the computer and the human on the the natural language. Besides, today's demand from the society is to be multifunctional in daily life. Thus, virtual assistants provide the opportunity of "hands-free" activity while processing some requests for a human. Moreover, AI technologies together with virtual assistants are viewed like one of the perspective methods of the teaching-learning process.

In recent years, the integration of artificial intelligence (AI) into education has transformed the landscape of the teaching-learning process. Among the various AI tools available, ChatGPT has emerged as a popular resource for educators and students alike. This advanced language model, developed by OpenAI, offers an innovative approach to enhancing learning experiences by facilitating personalized interactions and providing instant access to information. However, the implementation of such technology also raises important questions about its effectiveness and implications for traditional teaching methods.

The actuality of viewing the question from the positions of AI and ChatGPT can be formulated the following way. Firstly, we generally understand that AI (Artificial Intelligence) is a broad field encompassing various technologies and methodologies designed to create systems that can perform tasks typically requiring human intelligence. This includes capabilities such as understanding natural language, recognizing patterns, making decisions, and learning from data.

Meanwhile, ChatGPT, developed by OpenAI, is a specific application of AI—more precisely, it is a conversational agent (or chatbot) powered by a model known as GPT (Generative Pre-trained Transformer). GPT is a type of language model that has been trained on vast amounts of text data to understand and generate human-like text.

These two elements have close connections. Consider:

Natural Language Processing (NLP)

- ChatGPT is a product of advances in NLP, a subfield of AI focused on the interaction between computers and human language. It uses deep learning techniques to analyze and generate text, enabling natural conversations.

Machine Learning

- ChatGPT utilizes machine learning algorithms to improve its performance over time. It has been trained on diverse datasets to understand context, nuance, and human-like responses.

Deep Learning

- The architecture of ChatGPT is based on deep learning techniques, particularly transformers, which allow it to process and generate complex language patterns effectively.

Pre-training and Fine-tuning

- ChatGPT underwent a two-stage training process: pre-training on a large corpus of text to learn language structure and fine-tuning on specific tasks to enhance its conversational abilities.

Applications of AI in ChatGPT

- ChatGPT serves as an example of how AI can be applied in practical scenarios, including customer support, content generation, tutoring, and creative writing.

Ethics and Safety in AI

- The development and deployment of ChatGPT involve considerations of ethical AI use, including addressing biases, ensuring user privacy, and preventing the dissemination of harmful content.

Overall, ChatGPT exemplifies how AI technologies can be harnessed to create sophisticated tools that enhance human-computer interaction, demonstrating the transformative potential of AI in various domains. As well as, the significance and importance of applying AI and ChatGPT in the modern teaching technologies today should be understood and used in the classrooms.

As educators explore the potential benefits and challenges of incorporating ChatGPT into their classrooms, it becomes essential to understand both sides of the equation. On one hand, ChatGPT can foster engagement, promote critical thinking, and support differentiated learning. On the other hand, concerns regarding academic integrity, reliance on technology, and the quality of information provided persist.

In the next paragraph we are going to have a detailed look at the theoretical basis of AI, ChatGPT and their application in education.

2. Theoretical issues

To start the discussion of the pluses and minuses of ChatGPT in the teaching-learning process, it seems rational to view the elements of this process themselves. The first element is artificial intelligence.

The rise of AI is one of the most talked-about topics in modern technology. The general definitions that could be met in the Internet are nearly close.

B.J. Copeland defines AI as a kind of ability of a digital computer or computer-controlled robot to proceed tasks which are associated with intelligent beings [1]. The Commission Communication on AI insists that it refers to systems which are able to display intelligent behaviour by analysing their environment and taking actions giving some degree of autonomy for achieving specific goals [2]. Chisel glossary underlines that AI is a subfield of computer science which is focused on intelligent machines that are capable of doing activities that would normally need the intelligence of a human [3].

Summarising these three definitions, the author points out the words, starting with letter “a”, like, ability, activity, action, autonomy, associated, analysis, achieving. These words can define AI, especially its “artificial” part. It means that

such characteristics are useful and rational in applying them in the educational process.

2.1 History of AI and ChatGPT

Many researchers, scientists, and institutions have contributed to the study of artificial intelligence (AI) and the development of models like GPT (Generative Pre-trained Transformer). Here are some key figures and institutions associated with these fields:

OpenAI: The organization behind the development of the GPT series of models, including GPT-1, GPT-2, GPT-3, and GPT-4. Researchers at OpenAI, such as Ilya Sutskever, Wojciech Zaremba, and Sam Altman, have been instrumental in advancing these technologies.

Geoffrey Hinton, Yann LeCun, and Yann LeCun: Often referred to as the “Godfathers of Deep Learning,” these researchers have made significant contributions to neural networks and AI.

Andrew Ng: A prominent figure in AI, Ng has worked on various aspects of machine learning and co-founded Google Brain and Coursera.

Ali Farhadi: Known for his work in computer vision and machine learning, he has also contributed to understanding AI’s intersection with natural language processing.

Academic Institutions: Many universities and research institutions have AI research departments, including Stanford University, MIT, Carnegie Mellon University, and UC Berkeley [10].

Numerous researchers worldwide continue to explore different aspects of AI and natural language processing, contributing to theories and applications related to AI technologies like GPT.

The field of AI is vast and dynamic, with continuous advancements driven by a diverse array of contributors. The majority of textbooks divide the chronology of AI into six decades, underlining significant milestones and breakthroughs.

1956: the introduction of the phrase “artificial intelligence” by John McCarthy.

1969: the development of the first general-purpose mobile robot, Shakey. This robot could perform tasks purposefully.

1997: the defeat of the world champion chess player, Garry Kasparov, by Deep Blue, IBM’s supercomputer. This computer triumph showed the power of AI in strategic decision-making.

2002: the introduction of the first commercially successful robotic vacuum cleaner, Roomba. This invention renewed household cleaning and brought AI into everyday life.

2005-2019: the fast development of speech recognition systems, robotic process automation, dancing robots and smart homes.

2020: the release of the Linearford AI algorithm, by Baidu, to help scientific and medical teams create a vaccine for the SARS-CoV-2 (Covid-19) [3].

In the next paragraphs practical recommendations are given of using AI and ChatGPT in educational processes, viewing this question from different sides.

2.4 AI in the teaching-learning process

Artificial Intelligence (AI) has increasingly become a transformative force in the teaching-learning process. Here are some general statements highlighting its role and impact:

Personalized Learning: AI enables customized learning experiences by analyzing individual student data, adapting content and teaching methods to meet diverse learning needs and paces.

24/7 Accessibility: AI-powered educational tools provide students with round-the-clock access to learning resources, enabling them to study anytime and anywhere, fostering self-directed learning. **Enhanced Engagement:** Interactive AI applications, such as chatbots and gamified learning platforms, can boost student engagement by making learning more dynamic and enjoyable. **Data-Driven Insights:** AI collects and analyzes vast amounts of data to provide educators with insights into student performance, helping identify at-risk students and facilitating timely interventions. **Efficient Administrative Tasks:** AI automates routine administrative tasks, such as grading and scheduling, allowing educators to dedicate more time to teaching and mentoring students. **Scalability of Quality Education:** AI makes high-quality educational resources more scalable and accessible to a larger number of students, breaking geographic and economic barriers to learning. **Support for Educators:** AI can serve as a valuable tool for teachers, providing resources, lesson plans, and even AI-generated feedback to enhance instructional strategies. **Continuous Improvement:** Machine learning algorithms help improve educational content and pedagogical approaches over time by continually learning from user interactions and outcomes. **Enhanced Collaboration:** AI facilitates collaborative learning experiences, allowing students to work together virtually on projects and receive feedback from AI systems that encourages peer interaction. **Lifelong Learning:** AI promotes a culture of continuous skill development by offering personalized learning paths and resources that adapt as learners progress in their careers and personal interests. **Inclusive Education:** AI tools cater to diverse learning needs, including those of students with disabilities, by offering tailored resources and support that promote an inclusive learning environment. **Ethical Considerations:** The integration of AI in education raises important ethical considerations regarding data privacy, equity, and the potential for bias, necessitating careful implementation and oversight [11].

In summary, AI has the potential to greatly enhance the teaching-learning process by providing personalized and efficient educational experiences, while also posing challenges that need addressing to ensure equitable benefits for all learners.

AI can be applied in the teaching-learning process in several directions: 1.Grading and assessment; 2.Personalized learning; 3.Lesson planning; 4.Class-

room management; 5.Virtual tutors; 6.Language translation; 7.Student analytics. Teachers have noticed three main benefits of using AI in daily teaching-learning process: improved personalized learning; automation of administrative tasks; enhanced student engagement and performance.

2.4 Common AI tools in the teaching-learning process: - Virtual assistants (e.g. chatbots); - Adaptive learning platforms; - AI-powered assessment tools.

Here are some samples of the educational platforms: Google Classrooms [4]; Knewton for adapting materials; IBM Watson for analysis of data.

Students can also learn on AI educational platforms together with their teachers:

1. Squirrel AI: Squirrel AI is an artificial intelligence education company that offers personalized learning solutions for K-12 students. The AI program uses data analytics and machine learning algorithms to analyze students' learning behaviors and tailor educational content to their individual needs. This can be a valuable tool for teachers to help students learn more effectively and efficiently [5]. 2. Cognii: Cognii is an AI-powered virtual assistant for educators that provides personalized feedback and assessments for students. The program uses natural language processing to engage students in interactive conversations, helping them to improve their critical thinking and communication skills. Teachers can use Cognii to create customized quizzes, assignments, and exams for their students [6]. 3. Gradescope: Gradescope is an AI-assisted grading platform that helps teachers grade assignments and exams more efficiently. The program uses machine learning algorithms to recognize handwriting and provide instant feedback to students. Teachers can use Gradescope to automate grading, track student progress, and identify areas where students may need additional support [7]. 4. Century Tech: Century Tech is an AI-driven learning platform that provides personalized education for students of all ages. The program uses artificial intelligence to analyze student data and create individualized learning pathways for each student. Teachers can use Century Tech to track student progress, identify learning gaps, and provide targeted interventions to help students succeed [8].

2.5 Chat GPT as an AI tool in the teaching-learning process

ChatGPT is an artificial intelligence language model developed by OpenAI, primarily designed for natural language processing tasks. It can understand and generate human-like text based on the input it receives. The model is built on the transformer architecture, which allows it to produce coherent and contextually relevant responses across a wide range of topics and prompts.

ChatGPT can be classified based on several criteria:

1. Type of Model:

- Generative Pre-trained Transformer (GPT): ChatGPT is a type of generative model that uses the transformer architecture. It falls under the category of neural networks specifically designed for handling sequential data.

2. Mode of Operation:

- Conversational AI: ChatGPT is designed primarily for chatbot applications and can interact with users in a conversational manner.

- Text Generation: It can also generate creative writing, summaries, and other forms of text-based output.

3. Intended Use Cases:

- Customer Support: Many businesses use ChatGPT to automate customer interactions.

- Content Creation: Writers and marketers leverage it for generating ideas, drafting content, and writing articles.

- Education and Tutoring: ChatGPT can assist in answering questions and explaining concepts in various subjects.

- Entertainment: The model can engage in games, storytelling, and other interactive applications.

4. Training Methodology:

- Supervised Learning: The model is trained on a diverse range of internet text but is fine-tuned with human feedback to improve its conversational capabilities and contextual understanding.

5. Versioning:

- ChatGPT has different versions based on improvements and updates made over time, such as GPT-2, GPT-3, and subsequent iterations.

ChatGPT can play a significant role in the learning-teaching process by serving as a versatile tool for both educators and students. Here are some ways it can be integrated into the educational environment:

For Educators

1. Resource Creation: Teachers can use ChatGPT to generate lesson plans, quizzes, and educational materials tailored to their curriculum. This can save time and provide new ideas for engaging activities.

2. Instant Feedback: ChatGPT can assist educators in providing quick feedback on assignments or projects. It can help analyze student responses and suggest improvements.

3. Personal Tutoring: Educators can utilize ChatGPT to provide personalized tutoring sessions for students who may need additional help, ensuring that interventions are tailored to individual learning needs.

4. Classroom Management: ChatGPT can offer strategies for classroom management and engagement, helping teachers to navigate diverse learning environments effectively.

5. Professional Development: Teachers can utilize ChatGPT for their own professional growth by accessing resources on best practices, classroom strategies, and current educational research.

For Students

1. Interactive Learning: Students can engage with ChatGPT to ask questions about their lessons, clarify concepts, or delve deeper into subjects of interest, promoting active learning.
2. Homework Help: ChatGPT can assist students in understanding complex problems, providing guidance without giving away answers, thereby encouraging critical thinking.
3. Language Learning: Students learning a new language can practice conversational skills with ChatGPT, receive explanations of grammar rules, and expand their vocabulary in a supportive environment.
4. Study Aids: ChatGPT can help generate summaries, flashcards, or review questions to aid in studying, making it easier for students to retain information.
5. Project Ideas: Students can brainstorm with ChatGPT for project ideas, research topics, or creative writing prompts, fostering creativity and innovation.

Considerations

While ChatGPT is a powerful tool, it should be used thoughtfully to complement traditional teaching methods. Here are some important considerations. Accuracy of Information: Users should verify the information provided, as ChatGPT may not always have the most current or accurate data. Dependence: It's essential to promote a balance between using AI tools and developing critical thinking, problem-solving, and creativity skills independently. Ethical Use: Educators should guide students on ethical considerations, such as avoiding plagiarism and ensuring academic integrity when using AI tools. Accessibility: Ensuring that all students have access to AI tools and technology is crucial to avoid widening educational disparities.

2.6 Real examples of application of AI and ChatGPT

We decided to conduct an experiment asking for practical examples from different ChatGPTs in order to estimate the information given. And the results are impressive. We studied the answers from: - TalkAI; - Open AI.

Here are the example answer from TalkAI [9]. ChatGPT and similar AI tools have been successfully integrated into various educational settings, enhancing teaching and learning experiences. Here are some real-world case studies and examples showcasing effective implementations: 1. Personalized Learning: A middle school in California implemented ChatGPT as a personal learning assistant for students struggling with math. Students could ask ChatGPT questions about problem-solving techniques and receive tailored responses. Educators reported improved comprehension and engagement, with many students expressing comfort in asking questions they might hesitate to ask a teacher. 2. Writing Assistance and Feedback: A high school English teacher in New York utilized ChatGPT to help students brainstorm ideas and develop outlines for their essays. The AI pro-

vided suggestions on structure, vocabulary, and grammar. After initial training on how to use the tool effectively, students began to submit higher-quality drafts, and the teacher could spend more time on one-on-one feedback sessions.

3. **Language Learning:** A language immersion program in a Chicago school employed ChatGPT to facilitate conversational practice for students learning Spanish. The AI acted as a dialogue partner, allowing students to practice speaking and writing in a conversational context. Educators noted an increase in student confidence and proficiency in the language over time.
4. **Tutoring and Homework Help:** A rural school district in Texas used ChatGPT as an after-school tutoring assistant. Students could access the platform outside classroom hours to get help with homework or review concepts they missed. The school reported a noticeable improvement in homework completion rates and student performance in subsequent assessments.
5. **Classroom Engagement:** In a science classroom in London, a teacher employed ChatGPT to generate quizzes and interactive content related to ongoing lessons. Students engaged deeply with the material as they participated in live quizzes, discussions, and feedback sessions powered by AI-generated questions and answers. This approach fostered a collaborative learning atmosphere.
6. **Coding and STEM Education:** A coding bootcamp for teens incorporated ChatGPT to assist students as they learned programming languages. Students used the AI to ask coding-related questions and receive explanations or troubleshooting help. This self-guided support was instrumental in aiding students who needed extra help outside the formal class hours, resulting in a higher project completion rate.
7. **Project-Based Learning:** An interdisciplinary project at a university involved students from different faculties working on sustainability initiatives. They leveraged ChatGPT for research assistance, generating ideas, and drafting project proposals. The AI tool helped streamline the brainstorming process, leading to innovative project outcomes and enhanced collaborative skills among students.
8. **Critical Thinking Development:** A philosophy class at a community college used ChatGPT to debate philosophical concepts. Students would pose questions to the AI and then argue its responses in class discussions. This not only helped students refine their critical thinking skills but also promoted deeper engagement with complex topics.
9. **Administrative Tasks:** Educators at a K-12 institution employed ChatGPT to streamline administrative tasks such as developing lesson plans, generating newsletters, and even creating feedback forms for students. This saved teachers time and allowed them to focus more on instructional delivery and less on paperwork.
10. **Professional Development:** School districts organized workshops where teachers learned to integrate AI tools like ChatGPT into their teaching strategies. Many reported feeling more empowered and equipped to enhance their pedagogical practices and effectively engage students with diverse learning needs.

These examples demonstrate the versatility of ChatGPT in the classroom and its potential to enhance educational outcomes across various subjects and edu-

cational contexts. Proper training for educators and thoughtful implementation strategies are crucial for maximizing the benefits of these AI tools.

The next examples given are closely connected with educational process.

2.7 Practical examples of applying Chat GPT as an AI tool in the teaching-learning process

As it was mentioned above, both - students and teachers - should be careful and accurate using Chat GPT tools in the teaching-learning process. If we work with ChatGPT platform we should know how to write prompts (instructions) for, consider, the plan of the lesson.

Compare two variants (tasks are given to ChatGPT):

Prompt # 1.

Create a lesson plan on Easter celebrations in different countries

Lesson Plan: Easter Celebrations Around the World [9]

Grade Level:

Grades 4-6

Duration:

2 Class Sessions (60 minutes each)

Objectives:

- Students will learn about various Easter traditions and celebrations in different countries.

- Students will compare and contrast these celebrations, understanding cultural diversity.

- Students will create a project that illustrates their understanding of a specific country's Easter celebration.

Materials:

- World map

- Markers and colored pencils

- Construction paper

- Projector and screen (for videos/images)

- Access to the internet for research

- Printed handouts with country-specific Easter customs (for groups)

Session 1: Introduction to Easter Celebrations

Introduction (15 minutes)

1. ****Icebreaker Activity****: Ask students what Easter means to them and how they celebrate it. Record responses on the board.

2. ****Discussion****: Introduce the topic of Easter celebrations around the world. Discuss the significance of Easter in Christianity, as well as how it has been embraced by different cultures globally.

Group Activity (30 minutes)

1. ****Divide Students into Small Groups****: Assign each group a different country known for its unique Easter traditions, such as:

- Italy

- Greece

- Spain
- Germany
- Australia
- Sweden
- Poland
- Ethiopia
- United States

2. ****Research****: Each group will use internet resources to gather information about:

- Customs and traditions (e.g., food, activities, rituals)
- Duration and timing of celebrations
- Any unique items (e.g., Easter eggs, bonfires, etc.)
- Religious significance (if applicable)

3. ****Prepare a Short Presentation****: Groups will summarize their findings to share in the next session.

Homework:

- Ask students to prepare a simple visual aid (poster, PowerPoint slide, etc.) to display during their group's presentation.

Session 2: Presentations and Group Discussion

Group Presentations (30 minutes)

1. ****Sharing Findings****: Each group presents their research findings to the class, using their visual aids. Encourage them to share interesting facts, stories, or traditions.

2. ****Class Engagement****: After each presentation, allow 2-3 minutes for questions and discussions. Ask students to share what they found most surprising or interesting.

Class Discussion (20 minutes)

1. ****Comparison Activity****: Create a Venn diagram on the board to compare and contrast different countries' Easter celebrations. Discuss:

- Similarities: Are there common themes or customs?
- Differences: What stands out as unique to each country's celebration?

2. ****Cultural Appreciation****: Talk about the importance of respecting and understanding cultural differences in traditions and celebrations.

Creative Project (10 minutes)

1. ****Assign a Creative Project****: Students will create a project based on what they learned:

- A poster illustrating the Easter traditions of their assigned country.
- A short story depicting an Easter celebration in that country.
- A recipe card for a traditional Easter dish from that country.

2. ****Presentation of Projects****: Schedule a day for students to present their projects in the following week.

Assessment:

- Participation in group activities and discussions
- Quality and creativity of group presentations and individual projects
- Engagement and willingness to share thoughts during discussions

Modifications/Accommodations:

- Provide extra support and resources for students who may have difficulty with research.

- Allow for differentiation in projects; students can choose a medium they are comfortable with (art, writing, digital presentations).

Conclusion:

Reflect on the significance of cultural traditions and how they bring people together, celebrating both shared beliefs and diversity within the global community. Encourage students to explore their own backgrounds and family traditions as an extension of this lesson.

This lesson plan promotes engagement, teamwork, and intercultural understanding by exploring the rich tapestry of Easter celebrations worldwide.

This plan is quite acceptable, therefore, ChatGpt has chosen the duration of classes, the age of students, the materials and types of work by itself. This can be the minus for a teacher who is not aware of using prompts correctly.

Prompt # 2.

Create a lesson plan on Easter celebrations in different countries

Age group: foreign students of the first course in the university

Duration: 1 hour 30 minutes

Materials: films, dialogues

Level of English: Intermediate

Notes: some of students are Muslims and do not know this holiday

Lesson Plan: Easter Celebrations in Different Countries [9]

****Age Group:**** Foreign university students (First course)

****Duration:**** 1 hour 30 minutes

****Materials:****

- Short documentaries or clips about Easter traditions from various countries (e.g., USA, Italy, Greece, Spain, and Australia)

- Handouts with dialogues about Easter customs

- Whiteboard and markers

- Projector (for films)

- Paper, pens/pencils for student notes

****Level of English:**** Intermediate

Objectives:

1. Students will learn about Easter celebrations in different countries.

2. Students will understand the historical and cultural significance of Easter.

3. Students will engage in discussions about traditions, including those they may relate to or find unfamiliar.

4. Students will improve their listening and speaking skills through dialogues and group discussions.

Lesson Outline:

****I. Introduction (10 minutes)****

Scientific research of the SCO countries: synergy and integration

- Welcome the students; explain the significance of Easter as a Christian holiday celebrating the resurrection of Jesus Christ.

- Briefly discuss that some students may come from backgrounds where Easter is not celebrated, emphasizing respect and openness to learn about different cultures.

****II. Warm-Up Activity (15 minutes)****

- ****Question on the Board:**** “What are some holidays that are important in your culture?”

- Students will briefly share in pairs what they consider important holidays and their customs, allowing for cultural exchange and understanding.

- Take a few volunteer responses and note the similarities/differences on the board.

****III. Viewing Activity (20 minutes)****

- Show short clips (3-4 minutes each) about Easter traditions from at least three different countries:

- United States: Easter egg hunts, family gatherings.

- Italy: Scoppio del Carro (Explosion of the Cart) and traditional meals.

- Greece: Midnight church services and lamb roasting.

- After each clip, pause for a couple of minutes to summarize and discuss key points.

Encourage students to ask questions.

****IV. Group Activity (20 minutes)****

- Divide students into small groups (3-4 per group).

- ****Handout:**** Provide each group with a different dialogue or excerpt describing Easter traditions from a selected country.

- Each group will read, analyze and prepare to present a summary of their piece to the class. Encourage them to focus on the unique aspects and the cultural significance of the traditions.

****V. Group Presentations (15 minutes)****

- Each group presents their findings in no more than 2-3 minutes.

- Encourage questions and discussions after each presentation to foster interaction and deeper understanding.

****VI. Conclusion and Reflection (10 minutes)****

- Discuss how learning about different celebrations may enhance their appreciation of diverse cultures.

- Ask students to reflect on what they learned and share any traditions from their own cultures that may be similar or different.

- Conclude with a question to ponder: “How do cultural celebrations influence our sense of community and belonging?”

Assessment:

- Participation in discussions and activities.

- Engagement in group presentations.

- A short reflection paragraph due next class, summarizing what they learned about Easter and how it relates to their cultural experiences.

- ****Notes for Implementation:****

- Keep an inclusive and respectful atmosphere, especially considering that some students may not be familiar with Christian traditions.
- Be prepared to offer additional information for students interested in learning more about the historical context of Easter.
- Make adaptations as necessary based on the specific needs and backgrounds of the students in the class.

In the second plan every detail is clear for a teacher. Moreover, Chat GPT has shown the necessity of tolerance on the lesson taking into account the note in the prompt.

3. Conclusions

Overall, ChatGPT represents a significant advancement in AI-driven text generation and conversational interfaces, providing real-time responses that can mimic human communication.

Using ChatGPT in education comes with its own set of advantages and disadvantages. Here's a breakdown of the pros and cons:

Pros:

24/7 Accessibility: ChatGPT is available anytime, providing students with immediate assistance outside of traditional classroom hours.

Personalized Learning: The tool can cater to individual student needs, allowing for a personalized learning experience that can adjust to the pace and style of each learner.

Enhanced Engagement: Students may find interacting with a chatbot more engaging than traditional methods, potentially increasing their interest in the subject matter.

Resource Availability: ChatGPT can serve as a source of information, providing explanations, summaries, and examples on a wide range of topics.

Assistance with Homework: It can help students understand complex concepts and assist in problem-solving, which could enhance their learning.

Language Support: Multilingual capabilities can aid students who are non-native speakers, helping with language learning and communication.

Scalable Solution: Teachers can use ChatGPT to handle repetitive questions or tasks, freeing up time for more individualized instruction.

Safe Learning Environment: It can provide a non-judgmental space for students to ask questions they might feel uncomfortable asking in a classroom.

Cons:

Accuracy and Reliability: ChatGPT can sometimes provide incorrect or misleading information, which could lead to misunderstandings if students do not critically analyze its responses.

Dependence on Technology: Over-reliance on AI tools may hinder the development of critical thinking and problem-solving skills in students.

Lack of Human Interaction: Education involves social learning; excessive use of AI could result in reduced interpersonal skills and a sense of isolation among students.

Limited Context Understanding: ChatGPT may not grasp the full context of a student's question or the nuances of complex topics, potentially leading to inadequate assistance.

Ethical Concerns: Issues such as plagiarism, academic dishonesty, and misrepresentation can arise if students use AI-generated content without proper understanding.

Variability in Responses: The quality and relevance of responses can vary, leading to inconsistent educational support.

Privacy Concerns: The use of AI in education raises questions about data security and the handling of personal information.

Inequity in Access: Not all students may have equal access to technology, which could deepen existing educational inequalities.

While ChatGPT offers promising benefits for enhancing education through personalized learning and accessible support, it is essential to approach its usage judiciously. Educators must supplement AI tools with critical thinking skills and ensure that they are integrated thoughtfully into the learning process.

In conclusion, ChatGPT has the potential to enhance the learning-teaching process by providing support, resources, and personalized learning experiences, benefiting both educators and students when used effectively.

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新中国音乐教育哲学：现代视野的形成历史与困境

**PHILOSOPHY OF MUSIC EDUCATION IN THE NEW CHINA:
THE HISTORY OF FORMATION AND DILEMMAS OF MODERN
VISION**

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摘要：本文分析了新中国音乐教育哲学的发展历史，特别是对基于时间顺序分类的创始人韩竹龄等人的著作中关于音乐教育哲学的研究进行了梳理。通过考察各个发展阶段（1949–1977年；1978–1999年；2000年至今），本文认为，新中国音乐教育哲学史的发展与社会发展、国民民族自我意识的提升息息相关，体现了从整体到局部、从抽象到具体、从知识到技能的辩证发展规律。

关键词：音乐教育哲学史；演变；分类；阶段；音乐的社会功能；审美价值；能力路径；困境。

Abstract. *The article analyzes the history of the development of the philosophy of music education in New China, and in particular, the study of this issue in the works of Han Zhuling, the author of the classification based on the chronological principle. Having considered each of their stages (1949-1977; 1978-1999; 2000-present), the article concludes that the history of the philosophy of music education in New China is associated with the development of society and national self-awareness of citizens of the country, as well as with the dialectic of development from the whole to the part, from the abstract to the concrete, from knowledge to skill.*

Keywords: *history of the philosophy of music education, evolution, classification, stages, social function of music, aesthetic values, competence approach, dilemmas.*

Introduction to the Problem

Many researchers have addressed the issues of the philosophy of music education in New China – Wu Xiao [1], Wu Jingxiong, Liu Yonglian [2], Zhang Zhu [3], Zhu Le [4]. Let us consider how this phenomenon is reflected in the works of Han Zhongling [5].

Han Zhongling, identifying the evolution of the named category, offers the following author's classification:

- the first stage (1949-1977);
- the second stage (1978-1999);
- the third stage (2000-present).

Each of these stages, according to Han Zhongling, determines the dominant direction. At the first stage, this is seen as the actualization of the social function of musical art; at the second - the aesthetic value of music; at the third - the ideas of subject literacy in the field of art and a competence-based approach to mastering music.

Discussion

Let us consider each of these stages in detail.

The first stage, as we see from the specified chronological data, began with the emergence of the PRC. In this regard, it is natural that it is imbued with the ideas of socialist transformations, national development, and the creation of New China. The country's education, including musical education as its component, had to correspond to the solution of these problems, which is confirmed by the provisions of the standard school music program of 1950, calling for:

- to develop in children a love of music in order to enrich life and form a strong desire to serve people;
- to cultivate patriotic feelings in children: the defense of the Motherland and peace throughout the world.

The subsequent standard of 1956 also emphasized the role of music in the context of its connection with society, with the Chinese people during the period of liberation revolutionary struggle and socialist construction. Unfortunately, later (by 1961), the role of musical education in the country was radically revised up until the beginning of the second stage.

The second stage restored the rights of musical art. Thus, from 1978 to 1989, music returned to the sphere of education. This was subsequently reflected in:

- The Seventh Five-Year Plan of the country (1986-1990), which put forward the ideas of comprehensive development as a complex of moral, mental, physical and aesthetic education;
- The decisions of the State Council of 1993, reflected in the Concept of Reform and Development of Education in China. According to this document, the country's music education began to be perceived as an organic part of the educational policy of the PRC;
- The decisions of the Third National Conference on Work in the Sphere of Education, held by the Central Committee, and in particular, on explaining the status and role of music and aesthetic education.

The third stage marked the beginning of the reform of the basic education curriculum in the PRC. The Ministry of Education issued the Standards of the Full-Day Compulsory Music Curriculum (Pilot Project) and the Standards of the Middle School Music Curriculum (Pilot Project) in 2001 and 2003. Both standards clearly put forward the concept of musical aesthetics as the core of the philosophy of music education, which reflected the continuity of the ideas of the second and third stages, but at the same time affirmed the practice-oriented nature of the area of knowledge in question. This focus became dominant in the Standards of the Compulsory Music Education Program of 2011 and 2017 and the education reform of 2019. Thus, in accordance with the innovations of recent years, three equally important aspects are distinguished in the philosophy of music education in the PRC: aesthetic perception, artistic expression, and creativity. Analyzing them, Han Zhongling sees two profound shifts:

- from focusing on the macro-aesthetic function of education to developing functional literacy at the level of children’s musical abilities;
- from focusing on the aesthetic characteristics of music itself to emphasizing the importance of musical and aesthetic practice.

Thus, the history of the formation of the philosophy of music education in China, according to Han Zhuling, is associated with:

- the development of society and national self-awareness of the country;
- with the dialectic of development from the whole to the part, from the abstract to the concrete, from knowledge to skill.

Conclusion: dilemmas of the current state of philosophy of music education in the PRC

Considering and analyzing the current state of research in the philosophy of music education, Han Zhuling identifies a number of problems, which he conditionally divides into three categories.

The first is an understanding of the starting point of research into the philosophy of music education and concerns the study of the general context of the development of the philosophy of music education.

The second is a discussion about the “aesthetic” and “practical” paradigms of foreign philosophical thought. The third can be considered as a discussion of the “aesthetic core” of the standards of the “Music” curriculum and is related to the practice of teaching music disciplines in primary and secondary schools in China.

From the above state of the philosophy of music education, Han Zhulin identifies three dilemmas that involve a difficult choice between two alternatives that exclude the only correct solution:

- Should teaching musical art take music as its main content or its derivative in the form of music education?

- Is the philosophy of music education universal or does it have national characteristics?
- Are the philosophical concepts of curriculum standards and the realities of school music education a separately existing theory and practice or an integrative combination that allows us to consider the phenomenon under consideration as a system?

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项目式学习法在我国高等职业音乐教育中的应用
**APPLICATION OF THE PROJECT-BASED LEARNING METHOD
IN HIGHER PROFESSIONAL MUSICAL EDUCATION IN CHINA**

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摘要: 本文分析了项目活动的基本特征以及在中国高等教育机构中应用该项目的具体情况。作者结合教师兼音乐家杨晓晖的经历,阐述了运用项目进行教学的现实意义。本文对当前该项目需求的展望与中国教育现代化的方向相契合,特别是与《中共中央、国务院关于深化教育改革、全面推进素质教育的决定》相契合。文章最后得出结论,指出了在音乐教师专业培训中运用项目教学法的若干教学条件。

关键词: 中国高等教育机构,项目活动法,学生,导师角色,实施有效性的教学条件。

Abstract. *The article analyzes the essential characteristics of project activities and the specifics of using this method in higher education institutions of the PRC. The author substantiates the practical significance of using projects, considering the experience of teacher-musician Yang Xiaohui. The article's vision of the demand for this method today is associated with the vector direction of education modernization in the PRC and, in particular, the "Decisions of the CPC Central Committee and the State Council on deepening education reform and comprehensively promoting quality education." The article concludes with conclusions containing a number of pedagogical conditions for using the project method in the professional training of a music teacher.*

Keywords: *higher education institutions of the PRC, project activity method, students, mentor role, pedagogical conditions for the effectiveness of implementation.*

Introduction

Both for the Russian Federation and for the PRC, the characteristic focus of education, the essence of which is seen in the active transformative activity of students at all educational levels. In this regard, Yang Xiaohui notes that such a trend should be decisive in a university and considers the mechanisms for implementing this process using the example of musical and professional training of a music teacher.

In Chinese universities, the training of a music teacher is associated with the formation of professional competence in the field of conducting lessons in primary and secondary schools, as well as organizing extracurricular cultural events. For this purpose, among a number of methods, the project-based learning method is used today as a way of interaction between teaching and learning.

Discussion

Long-term practice confirms that the project-based learning method combines theory with practice and develops students' creative abilities and skills to apply them in the professional sphere of activity. Asserting this position, Yang Xiaohui proposes a teaching model based on the project method in teaching music in order to develop national talents to solve the problems and demands of the new century.

Justifying the practical significance of the proposed solution, Yang Xiaohui compares his model with the one traditionally used in the context of professional education. The teacher-musician sees the difference between the two models in the mechanism for organizing educational activities. In one case, this is exclusively the transfer of knowledge. In another - improving the personal qualities of the future music teacher. Defending the importance of solving this problem, Yang Xiaohui refers to government documents, and in particular, to the "Decisions of the CPC Central Committee and the State Council on deepening education reform and comprehensively promoting quality education." Quality, as we see, is positioned as an important milestone, a category with a deep meaning, the vector direction of which is associated with moral, intellectual, physical, aesthetic education and personal development of students.

As is known, project-based learning originated in Europe as part of labor education. Gradually, in the middle of the 20th century, it began to improve and acquired the features of an independent self-sufficient phenomenon.

At the university, the project-based learning method is regulated by the teacher based on the professional competencies of students. Under the guidance of teachers, students develop project hypotheses, individually or in groups collect information, prepare research for presentation. Thus, active creativity is considered dominant in the course of implementing project activities. In this regard, it is important that the teacher's participation does not suppress the students' initiatives in trying to complete a specific work task.

In addition, an important condition in Chinese universities is understood to be the equal participation of each student in the project.

When developing a project, teachers of Chinese universities take into account the feasibility of the project and control the acceptable level of complexity.

Yan Xiaohui notes that based on personal experience, he came to the conclusion that for the successful project activities of future music teachers, it is necessary to familiarize students with the requirements in a timely manner, initiate the

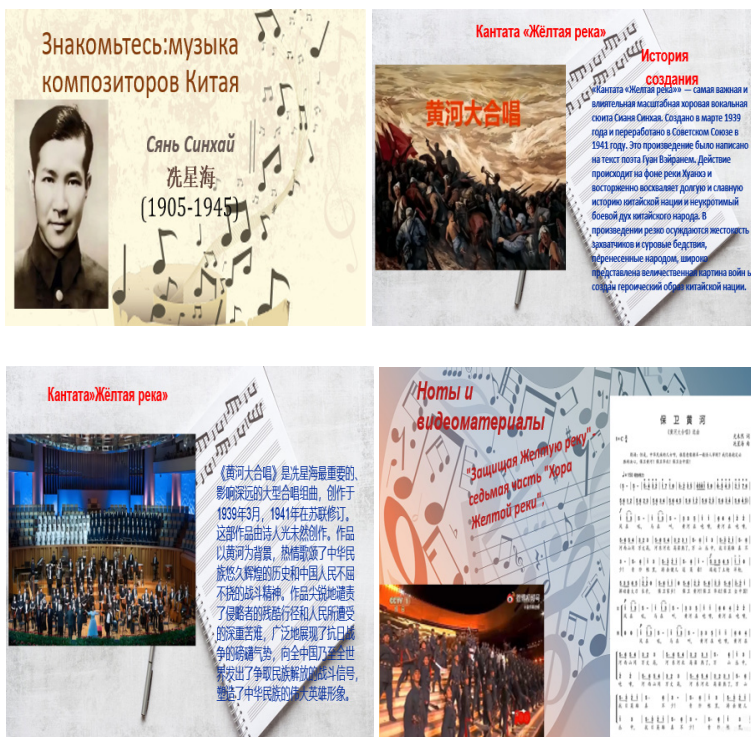
systematic implementation of the project and develop reflection competencies, as the ability to consciously pay attention to their own actions and decisions.

The teacher's correctional work is especially important, since students will overcome obvious difficulties; assessment activities and a system of incentives.

If these conditions are met, the project method in the professional training of music teachers in the PRC helps to reveal the potential of students, increase their creative abilities and develop team consciousness in jointly carried out research.

Conclusion

The approach to the use of projects in the educational process, practiced in the PRC, determines its obvious effectiveness, which is confirmed by the creative projects of Chinese students studying in universities in the Russian Federation. We will present the materials of similar projects developed by students of Moscow State Pedagogical University as part of their teaching practice (the authors of the project are first-year students of the Faculty of Musical Arts: Wang Jing, Wang Siyu, Xie Xinyu, Lu Hanyu)



As can be seen from the examples given, the project activities of the PRC students were focused on preparing methodological equipment for music lessons on studying the works of Chinese composers by Russian schoolchildren. Analyzing the project completed by the students, one can note the ideas formed by future Chinese music teachers about the need to combine information content and visuals in the project, taking into account the development potential of digital technologies and the role of intercultural communication, which is reflected, in particular, at the level of binary implementation of the project - in Chinese and Russian. In our opinion, this really has a developmental value, because similar projects are developed by students for use in Russia in schools with in-depth study of the Chinese language. At the same time, the projects being carried out concern both musical-listening activities and vocal-choral ones.



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“取消俄罗斯文化”条件下的艺术新闻：挑战与前景

ART JOURNALISM IN THE CONDITIONS OF “CANCELLATION OF RUSSIAN CULTURE”: CHALLENGES AND PROSPECTS

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摘要：本文致力于探讨艺术新闻在现代世界中的本体论地位及其传播实用功能，并结合西方集体主义关于“取消俄罗斯文化”的破坏性决策。本文旨在理解决定艺术新闻自身转型过程的因素和条件，以及由“新伦理”原则所决定的前景。事实证明，“取消俄罗斯文化”是西方国家的战略构想，这一构想具有破坏性，而艺术界和商界的代表们也意识到了这一点，并指出将俄罗斯排除在世界文化空间之外是不可能的。世界文化发展的现代条件对俄罗斯极具侵略性：其开放性正受到威胁。俄罗斯艺术新闻有责任积极抵制“取消俄罗斯文化”的表现，通过发挥教育功能来宣扬爱国主义并维护民族认同，这自然体现在新闻和分析性报道的体裁和形式中。

关键词：艺术新闻、“取消俄罗斯文化”、取消文化、文化代码、媒体空间、艺术内容、目标群体。

Abstract. *The article is devoted to the consideration of the ontological status and communicative-pragmatic functions of art journalism in the modern world, taking into account the destructive decisions of the collective West about the “cancellation of Russian culture”. The aim of the article is to understand the factors and conditions that determine the transformation processes inherent in art journalism, as well as the prospects that are determined by the principles of the “new ethics”. It has been proven that the “cancellation of Russian culture” is a strategic concept of Western countries, and this concept is destructive, while representatives of the art and business community are aware of this, pointing out the impossibility of excluding Russia from the world cultural space. The modern conditions in which world culture is developing are very aggressive towards it: its openness is under threat. Russian art journalism is obliged to actively resist manifestations of the “cancellation of Russian culture”, asserting patriotism and preserving national identity through the implementation of an educational function, naturally implemented in both news and analytical genres and formats.*

Keywords: *art journalism, “cancellation of Russian culture”, cancel culture, cultural code, media space, art content, target group.*

Introduction.

The modern media space demonstrates a huge variety of formats and methods of presenting material characterizing the processes of development of culture and its existence, while the journalistic community increasingly discusses the issues of the crisis of professional art journalism. It is obvious that the situation has remained problematic for quite a long time even against the backdrop of the launch of online publications and cultural platforms: the target group of such media is becoming increasingly small, while information portals of universal themes, in which culture can be given a separate section or art journalism is included in the content of a broader address, are gaining popularity. Financing of culture on a residual principle, which was carried out for a long time in Russia, has caused tangible damage to this most important sphere, which affects not only the general cultural level, but also the national identity of all representatives of Russian society. At present, we can state a disappointing fact: an entire generation has grown up that not only does not possess the cultural codes for perceiving information conveyed to the audience by professional art journalism, and this generation is not only not at all interested in even contemporary art and literature, not to mention the classics, Russian and world, but representatives of this generation are also proud of such ignorance, flaunting it. In these conditions, art journalism has to take on not only the functions of professional criticism and information about cultural events, but also an educational function, which, in order to be effective in the modern conditions of the development of various entertainment formats and technical means by which such formats are implemented, must be carried out in an unobtrusive form, without moralizing overtones. It seems that the sanctions imposed by the collective West on everything Russian, aimed not only at implementing economic and political pressure, but also at implementing the principles of the “cancel culture”, create favorable conditions for the effective development of Russian art journalism, as strange as it may seem, becoming a quite tangible, rather painful challenge, but in essence, quite surmountable.

The research methodology includes the observation method, the modeling method, the comparative-contrastive and deductive-inductive methods.

Main part.

Journalism is gradually becoming part of the entertainment industry, criticism - a form of marketing, which, as the researchers correctly noted, causes the development of opposite trends - the commercialization of art journalism and the growth of professional apathy [9, p. 539]. Professional art journalism is trying to defend its recent role as arbiters and culture bearers, but it is far from always possible to return to its former status. Indeed, art journalism, being by its nature a multidimensional phenomenon that is realized simultaneously in the mass media and cultural spaces, nevertheless remains in demand and relevant. Despite the

fact that the term “art journalism” itself, as well as the broader concept of cultural journalism, appeared in the media thesaurus quite recently, it unites areas traditional for journalism and publicism in general: literary, artistic criticism, news coverage in the cultural sphere, author’s reviews of any events and activities in the cultural sphere. At present, art journalism includes a wide range of materials that are presented in various genres. The general goal of art journalism is the popularization of art and literature phenomena with the expectation of expanding the target group; the audience of art journalism does not always have to have professional competencies in forming their own opinion about a particular aesthetic phenomenon. For all its focus on popularizing cultural phenomena, art journalism maintains a deep immersion in the material, and the authors working in this area of journalism are, first of all, professional art historians, initially addressing a narrow circle of professionals and art connoisseurs, and secondly (and far from always and not necessarily) transforming their message for a wider audience. In any case, here we can talk about a certain “blurring” of the boundaries of cultural journalism, which adapts cultural phenomena to the demands of the masses, and art journalism, which remains elitist, addressing an addressee capable of independently decoding complex art texts. At the same time, with the expansion of the capabilities of the World Wide Web, it must be noted that any person who does not belong to the professional community of art journalists now has the opportunity to speak out on any issue, including those related to art and literature, and therefore art journalism itself and, more broadly, cultural journalism, are forced to change. Now it is not enough to just acquaint the audience with reviews or report on any events taking place in the cultural space - it is important to comprehend the processes of modernity that influence the life and development of culture, to understand what are the options for the development of certain cultural events. In other words, a journalist working in the field of art journalism must have an active life position and a broad outlook, not lock himself in an “ivory tower”, but act in accordance with dynamically developing factors that determine the very attitude to specific cultural facts, forming the worldview of his addressee. We agree with I.V. Vysotskaya, who rightly asserts: “We cannot wait for a new Oswald Spengler to come and write a new “Decline of the West”, where he will explain everything. We must do it ourselves” [1, p. 207]. The mission of a journalist, no matter what segment of the media space he works in, is to focus not on business or on the government, but on society. Social responsibility in this case is positioned as compliance with patriotic ideals and the national idea. It is clear that art journalism should be outside of politics, but in the modern world all phenomena of not only public but also individual life are directly dependent on political decisions and the state of the economy, which, in turn, can no longer dictate its terms everywhere and to everyone. It is clear that in modern conditions, the constant adoption by

the collective West of packages of sanctions against the Russian Federation, the People's Republic of China, the Democratic People's Republic of Korea and other states has a decisive, often negative, impact on the economy of Western countries themselves. And the economic basis, in turn, determines the superstructure structures, including the cultural sphere in all its diversity. It is correct to understand the activity of a journalist as one that is equal in its spiritual potential to the activity of a teacher, doctor and cultural worker. And, of course, first of all, this applies to an art journalist. Constant contact with people, social activity determine the journalist's great responsibility to society. Art journalism, especially in its analytical and critical segment, does not currently have a central place even in sections devoted to cultural topics. It is obvious that all the attention of the public, both Russian and global, is focused on issues of war and peace both in Europe (which is connected with the special military operation conducted by the Russian Federation) and in the Middle East, as well as in connection with the situation around Taiwan. However, we emphasize that art journalism should in no case give up its positions, although even in calmer times it never occupied the central segments of the media space. Art journalism should remain a stronghold of a spiritual, sensitive person who finds moral support in the tradition of spirituality, albeit transmitted by an insignificant social group. The start of the special military operation in February 2022 was marked not only by the adoption of a number of economic sanctions against Russia, but also by the collective West's attempts to ban Russian culture, to refuse to perform music created by Russian and Soviet composers, to stop collaborating with prominent Russian performers, to not hold exhibitions in Russian museums, to not carry out academic exchanges with Russian universities, etc. Such a massive refusal to even mention anything Russian turned out to be directly related to the phenomenon of the "new ethics" and "cancel culture" that had developed in the media space long before the start of the SMO.

In the modern media space, the so-called new ethics and the corresponding "cancel culture" are now a kind of key narrative principle that to a certain extent allows us to judge current information: the communication strategies used by modern art journalism shape the media reputation of artifacts and the cultural environment. The modern media space is fundamentally focused on providing the addressee with reliable and consistent information, but the so-called new ethics and cancel culture are capable of producing contradictions in the goal-setting of the art journalist, which is correlated with the demands of the audience and with the filtering of the information flow. It is important here, in our opinion, to emphasize that in relation to art journalism, a very noticeable shift in emphasis, especially in the last two years, has been towards non-professional online criticism, which has recently become especially popular and has a certain degree of authenticity in relation to the object of art journalism under consideration. It seems that this is

not accidental: such non-professional art criticism is not controlled, is relatively independent, creative in relation to the art narrative. However, the absence of public control also has the opposite, purely negative effect, canceling the restrictions on the observance of professional and universal ethics, aesthetic criteria, public morality. Modern art journalism is increasingly characterized by the perception of art objects from the standpoint of everyday psychology, the network axiosphere, becoming individual creativity about creativity. A comprehensive description of the need and content of the “institute of ethical control and ethical expertise in the field of information ethics” [2, p. 29] allows us to describe it as a mechanism that is an integral part of the professional ethics of a journalist, with which in the modern media space the phenomenon of cancel culture is closely connected and conditioned by uncontrolled media criticism: “Social networks have democratized shaming, expanding its reach, removing any softening or humanizing context and leaving a huge mark on what could have been simple recklessness...” [3], as well as “with the absence of a self-regulation procedure in the system of socially significant media criticism” [6, p. 349].

Let us note in this regard that such a falsely understood democracy in the media space contributed to the development of the process of “cancellation of Russian culture”, which was supported by the art journalism of the collective West against the background of political decisions, for example: “After the start of the special operation in Ukraine, Western countries attempted to “cancel” Russian culture, refusing performances, productions and other events related to our country. However, attempts to isolate Western viewers from everything Russian have failed – Russian art is still available in Europe” [5]. It is noteworthy that the “cancellation of Russian culture” is directly linked to an attempt not only to deprive Russian performers or exhibition organizers of economic benefits, but also to damage Russia’s image in the international arena. However, the absurdity of such decisions is obvious: Russian culture is an integral part of world culture, so it is fundamentally impossible to simply ban or ignore its achievements: despite everything, theaters around the world will stage plays by A.P. Chekhov and A.M. Gorky, will hold exhibitions of Russian artists from different eras, will perform and listen to music by Russian and Soviet composers, and ballet and opera troupes of Russian theaters will perform, for which the works of Russian authors occupy a leading place in their repertoires.

Western European cultural figures and art journalists rightly emphasize in this regard the absurdity of political decisions that extend to the cultural sphere, for example: “It will not be possible to cancel communication between the authorities and society, or Russian culture itself, RT TV presenter Peter Lavelle is sure. “It would be comparable to amputating one of the limbs if you try to cancel Russian culture. Today’s attempts at “cancellation” are part of an ideology that is regulated

by the elites, but their narrative is absolutely not contextualized,” he noted” [7]. In the given fragment, what is noteworthy is the very placement in the same row not only of the authorities and society, but also of culture, as well as the legitimate understanding of “cancel culture” as a fragment of an ideology imposed by the political and economic elite of the West, which entails an incorrect interpretation of what is happening by an ordinary person who perceives reports about the “cancellation of Russian culture” in a series of other news items. Nevertheless, there are, of course, cases when the “cancellation of everything Russian” is understood literally and transferred from the sphere of politics and economics to the cultural space, for example: “The Pomeranian Philharmonic in Poland excluded works by Russian composers from its repertoire, although it announced that this measure was temporary and that Russians would return to the program as soon as peacetime arrived. Among other bans in Poland is the cancellation of Mussorgsky’s opera Boris Godunov and the disappearance of Shostakovich’s symphony Babi Yar from the program of the Beethoven Festival in Warsaw” [4]. Of course, in this case, Russian art journalism opposes such ideological bans with a neutral tone of communication, modeling a news report, while it is important to note that minimizing the evaluative component will most likely be the most advantageous communication strategy, allowing the correct value coordinates to be broadcast in the media space, capable of uniting Russian society in difficult times.

The museum media space also falls within the scope of consideration from the standpoint of the “cancel culture”, however, here too, a gradual and steady decline in its influence is observed, for example: “According to the “Association of Galleries”, Russian contemporary artists are shown in Italy, Austria, Germany, Estonia, and South Korea. “Artists continue to move between countries, create art in various residences, temporary workshops, and sometimes immediately sell it to local collectors,” noted a representative of the Association” [5]. We should also note that art journalism, albeit in a news format, conveys to its addressee the main value guidelines and, by broadcasting information outside of certain evaluative components, confirms the influence of museum collections and exhibitions in the cultural sphere despite the “cancel culture” asserted by the collective West, for example: “State guarantees for the protection of exhibits played their role - all works from state museums returned home. And 170 paintings and sculptures from the Morozov brothers’ collection, and exhibits from the Hermitage that participated in the exhibition in Milan “Grand Tour. The Dream of Italy from Venice to Pompeii” - although Finnish customs officers tried to detain them at the border. Works from the exhibition “Kandinsky, Malevich and the Russian Avant-Garde: Revolutionary Art” returned from Seoul. From London - items from state museums from the exhibition “Faberge in London. From Romanticism to Revolution”. In total, more than 1,500 museum exhibits from Europe, the UAE, Japan, Oman, and Belarus

were returned to Russia. But conclusions were drawn. On March 3, the Russian Ministry of Culture made an official statement that it was suspending the temporary issuance and temporary export of museum items from the territory of the Russian Federation” [8]. Let us emphasize in this regard that the “cancellation of Russian/Russian culture” is, first of all, a strategic concept of Western countries, destructive in nature: its main subjects are government bodies, while business and/or the professional art community are not only not interested in such actions, but also recognize the harm caused by government structures to the cultural sphere, and often openly support interaction with Russian cultural institutions and do not imagine a cultural space without the inclusion of the Russian segment in it.

Conclusion.

In the context of modern challenges, which are quite destructive for the very openness of world culture, Russian art journalism is capable of resisting aggressive manifestations of political forces: its role in preserving national self-awareness and patriotic education of the masses is enduring. At the same time, the adherence of an art journalist to the principle of non-interference in foreign policy processes (culture should not depend on political elites) does not at all hinder the process of implementing the idea of national dignity and pride for one’s country in the textual and discursive space of art journalism. An art journalist should directly express his/her public position, maintaining a respectful attitude towards the achievements of world culture as an enduring value, affirming the humanism of art.

Conclusions.

“The abolition of Russian/Russian culture” appears as anti-branding of the state: the national culture itself and its figures are boycotted as being connected with the government, as being financed by the state authorities. Serious damage to Russia’s image can be caused if cultural figures condemn state policy or refuse to support the actions of the authorities and, thus, by their example, and sometimes by direct appeal, contribute to destructive processes. In this regard, the value of art journalism as an educational and news resource increases many times over, but it is necessary to emphasize that journalists working in this area must, on the one hand, consistently implement in their activities the principle of independence of culture from political elites, but, on the other hand, affirm the ideas of national dignity and patriotism. Culture is one of the most semiotically loaded components of the Russian Federation brand, and the “cancellation of Russian / Russian culture” aims to exclude the country and its representatives from the cultural space of the collective West, thereby depriving the public of understanding Russian culture as freely developing, pointing out its dependence on state power and its decisions. Art journalism must respond to these challenges and, in the long term, increasingly effectively counteract the attempt to split Russian society through various genres and formats inherent in it in the modern media space.

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奥塞梯语言文化概念“Khwytsau”的名词成分
**THE NOTIONAL COMPONENT OF THE OSSETIAN
LINGUACULTURAL CONCEPT “KHWY TSAU”**

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摘要: 本文致力于探讨奥塞梯语言文化概念“赫维茨奥”(Khwytsau)中“神”的实义成分。本文基于词典条目、纳尔特史诗和奥塞梯语词库,分析了奥塞梯人关于神的观念。通过对“赫维茨奥”(Khwytsau)概念的客体进行语义一致性分析,并结合词源学分析,我们成功地从概念结构中分离出该概念的认知特征。

关键词: 语言文化概念, 主格场, 赫维茨奥 (Khwytsau), 认知特征, 概念核心, 实义成分, 语言文化。

Abstract. *This article is devoted to the notional component of the Ossetian linguocultural concept of **Khwytsau** ‘god’. Based on dictionary entries, the Nart epic and Ossetian paremias, the article analyzes Ossetian ideas about God. Through a consistent semantic analysis of the objectifiers of the concept of **Khwytsau**, as well as etymological analysis, we managed to isolate the cognitive features of the concept in its conceptual structure.*

Keywords: *linguocultural concept, nominative field, Khwytsau, cognitive feature, concept core, notional component, linguoculture.*

The notional component of the linguocultural concept is studied through the analysis of dictionary and other definitions that allow: 1) to present a socio-cultural reference, *i.e.* to carry out a cultural-historical or socio-historical commentary informing about the time of the appearance of a linguocultural character type through the historical-cultural and socio-political events of a certain time; 2) to identify the etymology of the name of the studied linguacultural type; and 3) to determine the cognitive features of the concept under study [9, p. 39].

The model of linguacultural type distinguishes between the core and the periphery [17, p. 48]. The core is represented by dictionary definitions that reveal the content of the concept in identifying the specifics of its linguistic expression. The periphery reflects the subjective experience realized in various pragmatic components of the lexeme, its connotations and associations [11, p. 58].

The main methods of concept analysis:

1) analysis of dictionary interpretations of the keyword in as many dictionaries as possible. A selection of all possible characteristics of the concept is made of the interpretations;

2) study of the polysemy of words in the process of its development. Analysis of the order of appearance of new meanings of words allows us to establish the features of the studied concept that determine this development [17, p. 49].

In this study, the notional component of the concept '*Khwytsau*' is revealed by analyzing Ossetian and Russian-language explanatory dictionaries, mythological, philosophical, encyclopedias, reflecting the content of the studied linguacultural concept '*Khwytsau*'.

Dictionary entries '*Khwytsau*' are presented both in printed publications and in electronic encyclopedias and dictionaries.

Khwytsau (pl. *khwytsæuttæ*) – god [16, p. 491].

In identifying the origin of the word *Khwytsau*, V. Abaev turned to different languages, but since the Christianization of the Alans took place in the Caucasus (in the 10th century), it is here that V. Abaev believes is the only correct place to look for the proto-form of the word *Khwytsau*. The scientist turned to the Lezgin, Georgian, and Chechen languages. In search of the proto-form, V. Abaev also turned to the Aryan languages of the Saka region, since of all languages the Saka language was the closest to Ossetian, cf. Lezg. *xucar* 'god', probably to Georgian *xucesi* 'elder, 'priest'. Georgian *xuca*, in turn, as the scientist notes, is connected in paleontological terms with *ca* 'sky'; cf. Chechen *c'u* 'deity'. V. Abaev drew attention to the fact that the Ossetian word *x,ycaw* (*Khwytsau*) cannot be compared with Sogdian *xutāw*, khorezm *xudau* 'god', since the transition *t* → *c* in this case cannot be justified in any way. However, the contamination of Caucasian **xuca* with Iranian *xutāw* cannot be ruled out [1, p. 255-256]. According to A. Chochiev, the Saka language really does have a god *hutaw* 'hutau', 'hu – good', 'taw – strength', and "V. Abaev noted that *hutaw* is not the "progenitor" of the Ossetian theonym '*xucau*', leaving without attention the form *huthaw*, from which '*xucau*' (<hu-TH-aw) is obtained quite well" [4, p. 38].

According to the Dictionary of Philosophy, the concept of *Khwytsau* is understood as a religious character in Ossetian mythology, which implies something supernatural, the strongest, the most intelligent, the wisest, and thanks to these qualities he is the creator of everything in the world, and can also control all the processes occurring in it. *Khwytsau* is unknowable, an object of blind worship and faith [6, p. 435-436].

In the Ethnography and mythology of the Ossets it is said that *Khwytsau* is the one great god – the creator of the Earth, a celestial being, an invisible supreme deity, often called *Khwytsæutty Khwytsau* 'God of Gods'. His location is also mentioned there: "Living in heaven ..."; *Khwytsau* is omniscient: "He knows

everything that happens on Earth”; he has a mediator: “His mediator between Heaven and Earth is Wastyrdzhi.” Here he is also described as the murderer of the Nart Batraz. Human qualities and emotions are also attributed to him, namely, the ability to cry: “The name of Khwytsau is associated with the emergence of three Ossetian sanctuaries – Rekom, Mykalgabyrta and Taranzheloz, which arose in the places where Khwycau’s tears fell, shed by him on the occasion of the death of Batraz, doomed by the God himself.” According to this source, the Ossetian God is not only merciful, but also cruel, he can both curse and destroy: “Khwytsau cursed the Narts, who imagined themselves equal to him, and ultimately destroyed them ...” [5].

In “Myths of the Peoples of the World” Khwytsau is described as the only Great God, the Creator of the Earth, the Mother of the Earth, a celestial being, an invisible deity. “Khwytsau is all-seeing and all-knowing, has a mediator between Heaven and Earth (Wastyrdzhi). Khwytsau occasionally descends to earth. With the help of the Sun, he destroyed Batraz. After the Narts demanded that Khwytsau openly come out to meet them and measure his strength with them, Khwytsau cursed the disobedient Narts and sent them death by starvation [12, p. 609], which also does not speak of his gracious good character.

According to Kh. Tsgoev, in Ossetian mythology, Khwytsau is “the Supreme, the one and only creator of the world, the patron of all that exists, the life-sustainer.” His more precise location is indicated here: “in the seventh heaven.” He is invincible: “no one will ever defeat him...”, despite the fact that he has an opposing force: “The opposite force to the power of the Supreme on earth are the dalimons” (demonological characters of Ossetian folklore). “He bestows fate: “distributes, gives life, fate and happiness to people. He sees everything and knows everything: who to bestow with good, and who to punish with misfortune...” [3].

And here again we find confirmation that the God of the Ossets is not always merciful: “There is nothing on Earth more terrible than the curse of the Supreme” [3].

Also, according to the beliefs of the Ossets, Khwytsau has a dwelling [3].

The conducted analysis of dictionary definitions allowed us to identify the following key features in the structure of the concept of Khwycau: 1) the Creator of the Earth; 2) the Creator of all that exists; 3) the patron of all that exists; 4) the only God of the Ossets; 5) the punisher of the Narts; 6) the murderer of the Nart Batraz; 7) the determiner of human destinies; 8) a celestial being; 9) a homeowner.

This statement is also confirmed by the following fragments of the Ossetian Nart epic and Ossetian proverbs and sayings:

Conceptual feature

- creator of the earth/world:

Хуыцау – дунейы рафæлдисæг (‘God is the creator of the world’); *Дуне иу лæджы тыххæй нæ рафæлдыста Хуыцау* (‘God did not create the world just

for one person’); *Дунейы иунæг Хуыцау рафæлдиста* (‘The world was created by One God’); *Хуыцау дунейы куы сфæлдиста, уæд адæм скæныны фæнд скодта* (‘When God created the world He decided to create a man’) [13, p. 14].

Conceptual attribute

- creator of all things:

Адæймагæн Хуыцау – йæ раттæг, йæ фæдзæхсæг ‘God is the creator of man, his patron and protector’; *Хæрзуындты дæр Хуыцау скодта, æмæ фыдуындты дæр* ‘Both the beautiful and the plain ones are created by God’; *Адæймаджы Хуыцау ратты æмæ йæ Зæхх айсы* ‘God gives a man, and the Earth takes him away’; *Адæймаджы Хуыцау куы нæ радтаит, уæддæр æй дæлимон сфæлдистаид* ‘If God had not created a man, then the devil would have created him’; *Хорз мад Хуыцауы рафæлдистæ у* ‘A good mother is a creation of God’; *Хуыцауы сконд рæстаг адæм сыхаг адæмтæм тыхæй нæ лæбурыци* ‘Good peoples created by God do not attack their neighbors’; *Хуыцау цæрынаен цы сфæлдыста, уыдонæн удтæ ис* ‘Into everything that God created for life, He breathed a soul’; *Цæстуарзон – Хуыцауы сконд* ‘A benevolent person is the creation of God’; *Сылгоймæгты дæр Хуыцау иухуызон не скодта* ‘God created women different’; *Сырды дæр Хуыцау цæрынмæ радта* ‘God also created animals to live’; *Табу нæ Раттæг, не Сфæлдистæгæн!* ‘Glory to our God, our Creator’; *Табу Хуыцауæн хъæуы, цард чи радта* ‘We must glorify God, the one who gave us life’; *Тæппуды дæр Хуыцау цæрынаен сфæлдыста* ‘Even the coward was created by God so that he could live’; *Фыс Хуыцауы сфæлдистæгæ цæрæгой у* ‘The Lamb is God’s creation’; *Хатыргæнаг – Хуыцауы сконд* ‘A forgiving person is God’s creation’; *Табу дунескæнæг Стыр Хуыцауæн!* ‘Glory to the creator of the universe, the Great God!’; *Алы уды дæр Хуыцау цæрынмæ радта* ‘God created every person for life’; *Аллайæг чи фæцис, уый дæр Хуыцауы ратгæ у* ‘Even the disgraced is created by God’; *Алцыдæр Хуыцауы ратгæ у* ‘Everything was created by God’, ‘God is the creator of everything that exists’.

Зæдтæ дын æгæр куы фæтыхстысты,

Хъæстмæ Хуыцаумæ уæд фæлыгъдысты:

«Уæ, не сфæлдистæг, дæумæ хъаст кæнæм.

Цæгъды нæ иугай Нарты ’ндон Батрадз... [14, p. 429]

‘When the deities were already too worried,

They complained to God:

‘Oh, Creator, we are looking for help from you

Protect us from the steely Batraz’.

Conceptual attribute

- patron of all existing:

Рæстаг куæг адæм Хуыцауы фæдзæхстæй – *Хуыцауы уазæг* ‘God protects the righteous working people’; *Сабыр – Хуыцауы уазæг* ‘God protects a calm person’; *Сабыр – Хуыцауы фæдзæхст* ‘God protects a calm person’; *Туджджын лæгдзинады охыл – Хуыцауы уазæг* ‘God protects the one who commits murder for the sake of justice’; *Уазæг дæм Хуыцауæй æрвыст кæй у, уый зон* ‘The guest was sent to you by God, mind this’; *Уазæг Хуыцауæй æрвыст вæййы* ‘The guest is sent by God’; *Уазæг – Хуыцауы уазæг!* ‘A guest is under protection of God’; *Фæндæгтæ дæр – Хуыцауы фæдзæхст, фæндаггæттæ дæр* ‘Both roads and travelers receive the protection of God’; *Кæнгæ æфсымæртæ – Хуыцауы æвджид* ‘The named brothers are under the auspices of God alone’; *Кæрдзындæттон Хуыцаумæ сæрмагонд хыгъды ис* ‘A generous person is in a special list with God’; *Кæрдзындæттонæн Хуыцауы дуæрттæ дæр гом сты* ‘God’s gates are open to a generous person’; *Кувæг адæммæ Хуыцау йæ ‘ргом здахы* ‘God faces the praying people’; *Хуыцауы хуыздæр лæвар – аудындынад* ‘God’s best gift is his protection’; *Ам аудæг Хуыцау зæххон лæгæн йæ къух сарæзта алæмæт мадзалай* ‘Here the patron God helped the man with the assistance of magic’ [14, p. 724]; *О стыр Хуыцау, кæй дын фæдзæхсын, уыдон де уазæг бакæн!* ‘O Great God, protect those for whom I pray!’ [15, p. 12]

Conceptual feature formulated as

- the only God of the Ossets:

Расты фарсхæцæг – Иунæг Хуыцау ‘Defender of the righteous ones is only God’; *Дунейы цунæг Хуыцау рафæлдыста* ‘The world was created only by God’; *Алы адæмæн хицæн Хуыцау нæй* ‘God is one’; *Алы адæмыхаттæн хицæн Хуыцау и, чи зæгъы, уыдон сты маенгдингæнджытæ* ‘Those who claim that every nation has its own God are false believers’; *Ай цунæг Хуыцау, æмбал кæмæн нæй, æххуысгæнæг фæу мæ сияхс æмæ мæ чызгæн!* [15, p. 12] ‘Oh, one incomparable God, help my son-in-law and my daughter.’

Conceptual attribute

- punisher of the Narts:

Сырдоны нартæн Хуыцау се сæфты тыххæй радта ‘God created Syrdon for the destruction of the Narts’.

We find confirmation of this conceptual feature not only in proverbs, but also in the Nart epic. The legend of *The Death of the Narts* describes how the Narts became proud, stopped honoring God, for which they were destroyed by Him: ... *æмæ сын Хуыцау цууыл сæ мыггаг аскъуыдта, æмæ баззæди Нартæн æрмæст сæ ном, æмæ ныр нæртон лæг нал и* [15, p. 607] ‘...and God destroyed them, and only the glory of the Narts remained on earth, not a single Nart is left’.

Conceptual feature

- the murderer of the Nart Batraz

In the Ossetian Nart legends, Khwytssau acts on the side of the celestials in their fight against the Narts, and is one of the murderers of the famous Nart Batraz [5].

Conceptual feature

- determining fate

Khwytssau bestows fate: “he distributes, bestows life, fate and happiness on people. He sees everything and knows everything: who to bestow with good, and who to punish with misfortune...” [3]. For this feature in the Ossetian language there is a lexeme **амондæттæг** (‘giving fate’) – an epithet applied only to the word **Khwytssau**, and in another context being its synonym.

Хуыцау – амондæттæг у ‘God determines fate’

Conceptual feature

- a celestial

«Живя на небе...» “Living in Heaven...” [5]

«Он сущ в самом наивысшем наднебесии — на седьмом наднебесии» [3]
“He exists in the highest Heaven – in the Seventh Heaven”.

Conceptual feature

- homeowner

«Только Уастырджи, говорят в народе, может без стука войти в **двери** Всевышнего...» [5] “Only Wastyrdzhi, as they say, can pass through the **doors** of the Almighty without knocking...”

So, the concept of **Khwytssau** among the Ossets serves to nominate God, the patron of the Earth and Heaven, the patron of all that exists.

We have examined the conceptual component of the concept of **Khwytssau** in the Ossetian linguoculture. The analysis of lexicographic sources allowed us to classify this concept as a culturally specific group. In the course of the study, the dominant semantic features of the concept under study were described. We include in the core of the concept “**Khwytssau**” lexical units that are united by the seme “Creator of the Earth”: “God of Gods”, “the only God of the Ossets”, “Invisible Supreme Deity”, “Creator of all that exists”, “Creator”, “Celestial Being”, “The Wisest”, “Omniscient”, “Invincible”.

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客体化与神圣化：女运动员的身体作为符号斗争的场域

**OBJECTIFICATION AND SACRALIZATION: THE
SPORTSWOMAN'S BODY AS A FIELD OF SEMIOTIC STRUGGLE**

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注释。本研究对当代体育话语中的女性运动员身体进行了全面的符号学分析，揭示了其作为多维且矛盾符号的一面。研究探讨了两个关键且往往相互冲突的过程之间的动态相互作用：客体化，将身体贬低为视觉、审美，有时甚至是性消费的对象，从而最大限度地降低运动员的主体性；以及神圣化，将身体提升为近乎神圣的自律、超越人类极限和追求完美的象征。

本研究特别关注身体的脆弱性和“崩溃”的符号学——伤病、生理极限和不可控的生理过程（如疲劳、呕吐、月经）的公开表现。研究揭示了这些时刻如何矛盾地不仅证明了人类的脆弱性，也强化了神圣化的叙事，凸显了运动员非凡的意志力和牺牲精神。

最后，分析超越了身体的动态功能，考察了永久性标记和个人表达的符号学：纹身、发型和赛前仪式。这些元素被探索为个人历史、身份、心理状态和文化归属的标志，将运动员的身体从工具转化为独特意义的载体。研究揭示了所有这些符号系统如何相互作用，在体育文化空间中塑造了对女性运动员身体的复杂理解。

关键词：体育符号学、女性运动员身体、物化、神圣化、体育话语、身体脆弱性、生理极限、身份、纹身、运动仪式、体育中的性别、视觉表征。

Annotation. *This study offers a comprehensive semiotic analysis of the female athlete's body in contemporary sports discourse, revealing it as a multidimensional and ambivalent sign. The work investigates the dynamic interplay of two key, often conflicting processes: objectification, which reduces the body to an object of visual, aesthetic, and at times sexual consumption, minimizing the athlete's subjectivity; and sacralization, which elevates the body to an almost sacred symbol of discipline, overcoming human limits, and perfection.*

Particular focus is given to the semiotics of body vulnerability and 'breakdown' – public manifestations of injuries, physiological limits, and uncontrollable biological processes (such as fatigue, vomiting, menstruation). It is demonstrated how these moments, paradoxically, not only attest to human fragility but also reinforce the narrative of sacralization, highlighting the athlete's incredible will and sacrifice.

Finally, the analysis extends beyond the body's dynamic function, by examining the semiotics of permanent markers and personal expressions: tattoos, hairstyles, and pre-competition rituals. These elements are explored as signs of personal history, identity, psychological state, and cultural belonging, transforming the athlete's body from an instrument into a carrier of unique meanings. The research reveals how all these semiotic systems interact, shaping a complex understanding of the female athlete's body within the cultural space of sport.

Keywords: *Semiotics of sport, Female athlete's body, Objectification, Sacralization, Sports discourse, Body vulnerability, Physiological limits, Identity, Tattoos, Athletic rituals, Gender in sport, Visual representation.*

In the semiotics of sport, the athlete's body appears as one of the most loaded with meanings and contradictory signs. It is not only a tool for achieving a sporting result, but also a powerful carrier of cultural, social and aesthetic meanings transmitted to the audience. When analyzing sports discourse, especially when it comes to the body of a female athlete, two powerful and often conflicting processes of semiotization are clearly evident: objectification and sacralization. Understanding how these processes are formed and interact is critical to decoding the complex messages circulating in contemporary sport.

One of the dominant semiotic processes is objectification, in which the athlete's body (a phenomenon that certainly also occurs in men, but for women it has a much more pronounced and socially problematic character) is reduced to the level of an object – either for the gaze, or for consumption, or as a functional tool. This process ignores or minimizes the subjectivity, personhood, and autonomy of the athlete herself.

From a semiotic perspective, objectification is realized through a whole spectrum of signs. First and foremost, this is visual representation: media, whether television, photojournalism, or social media, often focus attention not so much on athletic achievements or technical skill, but rather on the athlete's appearance, her figure, and details of her equipment not directly related to performance. Angles, close-ups of specific body parts, the selection of images – all serve as signifiers whose primary signified is attractiveness, aesthetics, or even sexuality, rather than solely athletic prowess.

An additional sign contributing to objectification can be the design of the sports uniform itself. In a number of sports, it is deliberately made more revealing or form-fitting, serving not only a functional role but also as a signifier emphasizing the body as an object of aesthetic or sexual perception. Swimsuits in gymnastics, uniforms in beach volleyball or track and field, thus become part of a semiotic system that contributes to objectification.

Beyond the visual, objectification also manifests at the narrative level. Sports commentators and journalists frequently shift focus from analyzing the course of the competition, strategy, and technical execution to discussing the athlete's appearance, her emotional expressions (often interpreted through the lens of gender stereotypes), or even her personal life. This creates a discourse that places the athlete's body in a context distinct from purely athletic achievement. Furthermore, the commercial aspect of sports exacerbates this process: athletes' bodies are actively used in advertising campaigns, often not directly related to sports, where they serve as attractive models. Here, the body becomes a sign selling a product, completely detached from its primary athletic function. Finally, the influence of external beauty standards also contributes to objectification, forcing the athlete's body to be evaluated not only by its functional suitability for a specific sport but also by its conformity to external aesthetic norms, which can sometimes contradict athletic requirements.

Thus, through these and numerous other signs, objectification reduces the complexity of the athlete to their physical shell, making the body an object of consumption – visual, aesthetic, and at times sexual – on the part of the viewer, media, or industry.

However, parallel to the process of objectification, a seemingly opposite process also occurs in sports discourse – the sacralization of the athlete's body. This semiotic process elevates the body to an almost sacred, revered object, embodying the ideals of discipline, physical and mental perfection, overcoming human limits, and complete dedication. Within the framework of sacralization, the body is perceived not as a passive object for viewing, but as an active subject, the result of titanic labor, unyielding will, and spiritual strength.

The sacralization of the body is expressed through a series of signs and narratives. One of the key elements are stories about years of grueling training, courageous overcoming of injuries, strict discipline, and self-restraint. These narratives create an aura of sanctity, reverence, and sacrifice around the athlete's body, making it a sign of will and perseverance.

In sports where the aesthetics of movement are important – gymnastics, figure skating, synchronized swimming – sacralization manifests through admiration for the purity of lines, the perfection of element execution, grace, and expressiveness. Here, the body is revered for its ability to achieve exceptional aesthetic form and control, which is read as a sign of supreme mastery and harmony between body and spirit.

In sports based on physical prowess, such as sprinting, weightlifting, or marathon running, the body is sacralized for its outstanding functionality, its ability to perform at the limits of human capability. Muscles, speed, and endurance become signs of superhuman strength and resilience, inspiring awe.

Furthermore, the training process itself, preparation for competitions, and warm-ups frequently take on ritualistic characteristics, emphasizing the unique nature of the athlete's body, which demands specific handling and dedication. The body becomes a 'temple' of sorts, requiring constant care and 'offerings' in the form of countless hours of training. Finally, the symbolism of achievements – medals, records, victories – serves as a powerful sign, elevating the athlete's body and their successes to the level of national or even global heritage, imbuing them with a sacred dimension.

Thus, sacralization transforms the athlete's body into an object of admiration and worship, a symbol of human potential, spiritual strength, and the will to win.

A key point in the semiotics of the female athlete's body is that the processes of objectification and sacralization very rarely exist in isolation. They constantly intertwine, interact, and often come into conflict, creating a complex and ambivalent semiotic system. The same body, at the same moment in time, can be an object of admiration for its functional perfection and embodiment of ideals (sacralization) and simultaneously an object of aesthetic, and at times sexual, gaze, focusing on external qualities (objectification). Media and spectators constantly balance on the edge of these two interpretations, switching between them.

For the athlete herself, this duality creates an extremely complex semiotic position. She finds herself under pressure to be simultaneously a flawless functional instrument for achieving results (an object of function), an ideal work of art (an object of aesthetic perception), and yet forced to fight for the preservation of her subjectivity, autonomy, and integrity in the face of the external objectifying gaze. Her body becomes a battlefield of constant semantic struggle between these two competing interpretations.

The female athlete's body in sports semiotics is a multidimensional and ambivalent sign. It serves as an arena for the dynamic interaction and struggle of meanings, where powerful processes of objectification, reducing the body to an object of gaze and consumption, intertwine with processes of sacralization, elevating it to a symbol of perfection, discipline, and transcendence. Analysis of these semiotic dynamics not only allows for a deeper understanding of how athletes themselves are perceived in modern society but also reveals broader cultural attitudes and values associated with the body, gender, success, and spectacle. The athlete's body is not merely a biological given, but a 'text' saturated with cultural codes, the 'reading' of which reveals the deep layers of modern sports' semiosphere.

Speaking of the female athlete's body as a text, we cannot overlook its vulnerability, its capacity for 'breakdown,' and how the public manifestations of this breakdown or uncontrollable biological processes become powerful, at times shocking, signs. In a world where sport often seeks to present the body as a machine of perfection and control, moments when the body 'betrays' or reaches its

absolute limit reveal a different dimension of semiotics – a dimension of vulnerability, pain, and biological reality.

A body subjected to extreme loads inevitably shows signs of wear and tear and damage. Injuries – from sprains to fractures and ligament tears – are, in essence, graphic signifiers of the risk and sacrifice inherent in athletic activity. Scars on an athlete's body, bandages, limping after a match – all these are signs telling a story of struggle, pain, and a readiness to endure physical suffering for the sake of achieving a goal. In sports like cycling, where falls are part of the routine, or in contact sports such as football or rugby, where the body is constantly subjected to impacts, the very texture of the athlete's physicality becomes etched with these signs of 'breakdown'. A cyclist's broken collarbone, a footballer's cut above the eyebrow – these are not merely physical injuries; they are visible symbols of courage, resilience, and the physical price paid for participation in the 'text' of competition.

But even deeper and more taboo layers of bodily semiotics are revealed when not just injuries, but uncontrollable physiological processes – which are hidden in everyday life – enter the arena of public performance. Sweat streaming down, vomiting at the finish line of a marathon, cramps contorting the body with pain – all these are signs of the absolute limit, of exceeding control, evidence that the body has reached a point where it ceases to obey will and begins to live by its own, biological laws.

One of the most striking and widely discussed examples of this kind was British marathon runner Paula Radcliffe during the 2005 London Marathon. In the midst of the race, experiencing severe gastrointestinal issues, she was forced to stop at the roadside, squatting in full view of thousands of spectators and television cameras. Despite this, she continued to run and won the marathon. This episode became a powerful semiotic event: the athlete's body, usually an object of admiration and control, publicly revealed its most visceral, uncontrollable, and taboo side. From a semiotic perspective, this act was simultaneously a sign of extreme physical suffering and a sign of incredible mental fortitude – a willingness to sacrifice even basic human dignity (the embarrassment associated with physiological processes) for the sake of continuing the struggle and achieving victory. The body, 'soiled' in the public sphere, paradoxically became a symbol of the highest sporting purity – absolute devotion to the goal.

To this same category of signs belong the manifestations of the menstrual cycle. Although this topic is generally silenced in sports, periods can affect performance, and sometimes, under conditions of extreme exertion or prolonged competitions, become visible, moving beyond the private realm and becoming part of the public 'text' of the body. This is another example of how biological reality intrudes upon the idealized space of sport, reminding us of bodily vulnerability

and the specific nature of the female body, which at times becomes an obstacle or a challenge in the pursuit of athletic results.

It is interesting to contrast this modern ‘breakdown’ of the body and the manifestation of its uncontrollable sides with the historical context of the ancient Olympic Games. Athletes in Ancient Greece competed nude. This nudity had a completely different semiotic meaning: it was a symbol of purity (liberation from clothing as a sign of status or deception), equality before the gods and one another, and reverence for physical perfection as a gift from the gods. The naked body was a sign of beauty, strength, and discipline. However, even in this context, where the body was fully open to view, the emphasis was on its ideal state. Were signs of pain, fatigue, physiological malfunctions visible and discussed then? Historical sources speak more of heroic efforts and victories than of ‘unseemly’ details. Presumably, within that semiotic space, the emphasis was on the sacralization of the body through the demonstration of its strength and beauty, rather than its vulnerability.

In modern sports, despite the desire to polish the image and conceal ‘inconvenient’ details (unlike ancient nudity), moments when the body ‘breaks down’ or reveals its uncontrollable biological nature break through this veil. They serve as powerful signs. On the one hand, these are signs of limits and human vulnerability. On the other hand, they paradoxically reinforce the narrative of overcoming and sacralization, demonstrating the price at which results are achieved and how strong the athlete’s will is, capable of making the body move even when it literally ‘gives out’ or violates social taboos. The body that breaks down or reveals its biological reality thus becomes one of the most honest and dramatic signs in the semiotics of sport.

Sport is about movement. About strength, speed, agility, expressed through the body’s action in space. This is the primary language an athlete speaks in the arena. But the human body is not merely an instrument for performing a task; it is also a carrier of identity, history, and personality. Even when it is static, or when it bears permanent marks, it continues to speak. The semiotics of the body beyond its dynamic function – in tattoos, hairstyles, elements of appearance, and also in small, repetitive rituals – adds deeply personal and cultural layers of meaning to the sporting narrative.

Let’s consider tattoos. What was once the prerogative of certain subcultures has today become a ubiquitous phenomenon in sports. The athlete’s body, perfected through training, also becomes a living canvas for applying symbols that hold meaning for the individual. A tattoo can be a sign of personal history: a loved one’s birth date, a portrait of a deceased relative, a symbol of a past challenge or triumph. It’s a visual biography etched in ink, telling of aspects of life that remain outside the athletic field but shape the athlete’s personality.

Tattoos can also express belonging and identity: a hometown crest, a beloved team's emblem (even if the player now competes for another team), religious or cultural motifs. They can be a sign of resilience or rebellion, a demonstration of inner strength or an unwillingness to fully conform to accepted norms. In sports, where unification is often required (uniforms, rules of conduct), tattoos become one of the few legitimate means of self-expression, of imprinting a personal code that distinguishes one from others. They transform the body from a faceless instrument into a bearer of unique meanings.

Another aspect of the semiotics of appearance is hairstyles and style. Hair color, an unusual haircut, braids, dreadlocks – all these are choices made by the athlete that do not directly affect their physical capabilities but serve as a powerful visual statement. A hairstyle can be a tribute to fashion, a way to stand out from the crowd, a sign of belonging to a specific cultural group, or even an expression of protest. In team sports, one can sometimes observe several players adopting similar haircuts or dyeing their hair the same color – this is a semiotics of unity and team spirit, a visible symbol of cohesion. In individual sports, it's more a sign of individuality, an attempt to create a recognizable image. This aspect of semiotics is more mutable than tattoos; it can change over time, reflecting career stages or personal transformations.

Finally, rituals before starting or during a game. Repetitive actions – tapping cleats, a specific sequence of movements before a serve, touching the grass, crossing oneself, a particular way of adjusting one's uniform, arranging water bottles in a specific order (like Rafael Nadal) – are deeply personal semiotic acts. At first glance, this might seem merely superstitious, an attempt to appease luck or control the uncontrollable.

But on a deeper level, these rituals are signs of psychological preparation and concentration. They help the athlete to 'get in the zone,' to shut out the external world, to create a sense of order and predictability amidst the chaos of competition. It's a way to 'ground oneself,' to feel certainty through the repetition of familiar actions. They are a visible manifestation of the athlete's internal work, their battle with nerves and pressure. For the spectator, these rituals are signs of tension, focus, and the human need for orderliness even in the most thrilling moments.

Thus, the athlete's body 'speaks' not only through movement and strength. Tattoos, hairstyles, and personal rituals add layers of personal history, identity, psychological state, and cultural belonging to this communication. They transform the athlete from an abstract figure performing physical actions into a unique individual with their own past, fears, hopes, and ways of coping with pressure. By studying the semiotics of these aspects, we gain a more complete and humane understanding of those who step onto the arena, making the sporting spectacle even more multifaceted and meaningful.

世界卫生组织传统医药政策对中国医学博物馆发展的影响

THE IMPACT OF THE WHO'S TRADITIONAL MEDICINE POLICY ON THE DEVELOPMENT OF MEDICAL MUSEUMS IN CHINA

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摘要: 中医药是中国几千年来传承下来的宝贵财富。新中国成立以来,中国政府高度重视中医药事业发展,出台了一系列促进中医药事业发展的政策。医药博物馆作为历史教育和休闲空间,同时也是一个公共文化服务机构,可以更好地向公众介绍中医药文化知识,推动中医药文化的发展。世界卫生组织的传统医药政策也间接推动了中医药的国际化 and 医学博物馆的发展。

关键词: 世界卫生组织; 传统医学政策; 中医药博物馆的发展

Abstract. *Traditional Chinese medicine is a treasure that China has inherited for thousands of years. Since the founding of the People's Republic of China, the Chinese government has attached great importance to the development of traditional Chinese medicine and has introduced a series of policies to promote the development of traditional Chinese medicine. As a historic educational and leisure space, the medical museum is also a public cultural service institution that can better introduce traditional Chinese medicine cultural knowledge to the public and promote the development of traditional Chinese medicine culture. The World Health Organization's traditional medicine policy has also indirectly promoted the internationalization of Chinese traditional medicine and the development of medical museums.*

Keywords: *World Health Organization; traditional medicine policy; development of Chinese medical museums.*

As a unique health resource, a potential economic resource, a scientific and technological resource with original advantages, an excellent cultural resource and an important ecological resource, Chinese medicine plays an important role in China's economic and social development. With the in-depth development of my country's new industrialization, informatization, urbanization and agricultural modernization, the aging of the population is accelerating, and the health service industry is booming. The people's demand for Chinese medicine services is be-

coming more and more vigorous. It is urgent to inherit, develop and make good use of Chinese medicine, give full play to its role in deepening the reform of the medical and health system, and benefit human health. In order to clarify the development direction and work priorities of Chinese medicine in the next fifteen years and promote the healthy development of Chinese medicine, this planning outline is formulated [1]. As a public urban space, medical museums produce and reconstruct cultural landscapes in a special way, bridge people's spiritual life with aesthetic content, enable more people in society to understand the world and themselves from a new perspective, and promote the development of traditional Chinese medicine. Traditional medicine is an important and often underestimated component of health services. In some countries, traditional medicine or unconventional medicine can be called complementary medicine. In health care and disease prevention and treatment, especially for chronic diseases, traditional medicine has a long history. The strategy defines a number of actions for each goal to guide Member States, partners and stakeholders, and WHO. The strategy supports Member States in developing and implementing strategic plans based on their national capacities, priorities, relevant regulations, etc. Its purpose is to assist Member States in identifying their needs and priorities, promote effective service delivery, support the development of appropriate regulations and policies, and ensure the safety of these products and practices [2]. The WHO's traditional medicine policy indirectly affects the internationalization and modernization of Chinese medical museums. Museums are important vehicles for protecting and inheriting Chinese civilization and cultural heritage, and can contribute to the construction of a "Healthy China" [3]. WHO has repeatedly emphasized the importance of integrating traditional medicine into the national health system. For example, the 2008 Traditional Medicine Conference proposed that traditional medicine and Western medicine should complement each other harmoniously and play a role in primary health care. China has responded positively, incorporating traditional Chinese medicine into the national basic medical system, and displaying its historical and scientific value through medical museums, such as the Beijing Museum of Traditional Chinese Medicine and the Shanghai Museum of Traditional Chinese Medicine (Figure 1: China's earliest medical museum, founded by Wang Jimin [4]), which have become important platforms for spreading the culture of traditional Chinese medicine.

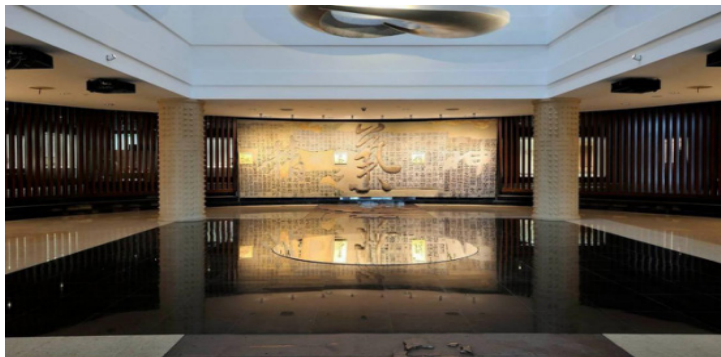


Figure 1. Shanghai Museum of Traditional Chinese Medicine <https://www.pudong.gov.cn/019023017003/20211218/319933.html>

The WHO requires that traditional medicine be verified based on scientific evidence and emphasizes the standardization of quality, safety, and efficacy. This has prompted China to not only display traditional medical artifacts in medical museums, but also to focus on combining modern scientific research results. For example, the discovery of artemisinin and its antimalarial effects have become an important case for the modernization of traditional medicine (Figure 2). Chinese scientist Tu Youyou won the Nobel Prize in Medicine for her research and development of antimalarial drugs[5].

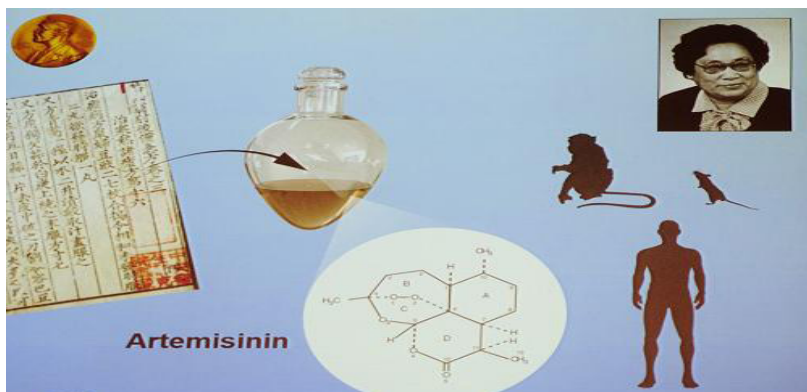


Figure 2. Discovery of artemisinin: http://www.81.cn/gnxw/2015-10/06/content_6709651.htm

WHO's recognition of the diversity of traditional medicine (such as Chinese medicine) has promoted the exploration and display of ethnic medicine by Chi-

nese medical museums. For example, the Mongolian Medicine Culture Exhibition (Figure 3) and the Qinghai Tibetan Medicine Culture Museum are dedicated to displaying the medical heritage of ethnic minorities, systematizing and visualizing the fragmented folk medicine knowledge.



Figure 3. Mongolian medicine culture exhibition: <https://bowuguan.bucm.edu.cn/tzgg/36651.htm>

WHO included traditional medicine in the International Classification of Diseases (ICD-11) and required countries to standardize the recording and coding of traditional medicine. This prompted the Chinese Medical Museum to incorporate international standards into its exhibition design. For example, the Chengdu University of Traditional Chinese Medicine Museum integrated traditional medicine data through digital means and connected it with the international classification system. WHO called for the combination of traditional medicine with academic research, so the Chinese Medical Museum emphasized the use of research to drive the collection and interpretation of cultural relics. In 2022, the 26th International Council of Museums Conference gave a new definition to the functions of museums: “research, collection, protection, interpretation and display of material and intangible heritage.” The new definition attaches special importance to the research function of museums, that is, the academic function, and puts it first. At the same time, it emphasizes the protection and interpretation functions, and supplements intangible heritage as a new object and new content of museum work. Compared with the original collection, research and education functions of museums in my country, the requirements are basically the same, but a more comprehensive definition of its functions is proposed, and the order of its functions is adjusted, and the content is more detailed and complete. These are all worthy of learning and

practice by medical museum workers and enthusiasts. Among these five functions, the first thing that needs to be emphasized is that the research function is the most important one among all the functions of the museum, and it is also its most important task. At the same time, the research function should also be comprehensive. It permeates the four functions of collection, protection, interpretation and display. Each of the other functions is inseparable from academic research and needs to carry out relevant academic research. The academic function runs through the entire process of the museum's work. Every work of the museum needs to be based on academic research. This may be the reason why research is placed at the top of its functions. The large number of manuscripts, copies, prescriptions, etc. collected by the Museum of Traditional Chinese Medicine are closely related to the academic status and influence of their owners. Things are valuable because of people, and things are prominent because of people. On this basis, specific research on the collection can be carried out, such as studying and mastering the age, content, value, and characteristics of the collection one by one. Then its protection measures, interpretation of connotation and meaning, and use arrangements in display and display will be solved. Among them, the protection function is most closely related to the collection. Listing the protection function separately as one of the basic functions of the museum shows the urgency and importance of cultural relics protection work. Of course, the collection work of the museum itself contains the protection of cultural relics. Chengdu University of Traditional Chinese Medicine compiled the results of TCM prescriptions, "Chu Hou Fang Bo: Collection of Prescriptions of Famous Doctors in Bashu" (Figure 4). This model is consistent with the "evidence-based traditional medicine" advocated by WHO.

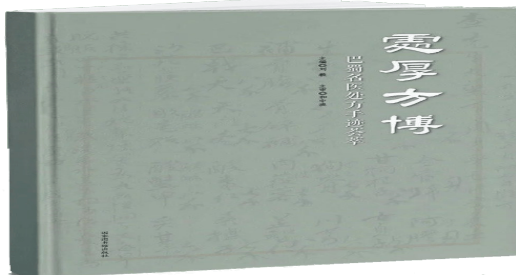


Figure 4. The results of the compilation of traditional Chinese medicine prescriptions: *Chu Hou Fang Bo: Collection of Prescriptions by Famous Doctors of Bashu*:https://www.cdutcm.edu.cn/bwgxsg/zx/xw/content_120939

WHO advocates improving public awareness of traditional medicine. The China Medical Museum promotes TCM culture and enhances public trust in tradition-

al medicine through interactive experiences (such as acupuncture simulation and TCM identification) and popular science activities (such as the TCM identification competition of Beijing University of Chinese Medicine). WHO has cooperated with China to hold several traditional medicine conferences (such as the 2024 World Traditional Medicine Conference) to promote the China Medical Museum to become a window for international exchanges. For example, the exhibition of Chongqing Folk Medicine Museum has been touring the United States, Germany, Thailand and other countries to showcase China's experience. WHO's Traditional Medicine Strategy (2025-2034)[6] requires countries to formulate localized policies. China has established the "China Medical Museum Construction Alliance" to integrate the resources of universities, hospitals and enterprises, promote the development of medical museums from specialties to comprehensive, and explore digitalization paths (such as the Beijing Digital Museum of Traditional Chinese Medicine). WHO's concern about the safety of traditional medicine has prompted China to strengthen the quality inspection and traceability display of TCM specimens in museums. For example, Yunnan Provincial Museum of Traditional Chinese Medicine and Ethnic Medicine emphasized the quality control process of traditional medicines through the "Dai Medicine Intangible Heritage Popular Science Exhibition". The creation of digital medical museums is conducive to the inheritance and development of medical culture. It is also of great benefit to the public with non-medical knowledge, including those who are curious or passionate about medicine, have specific needs or seek health science popularization. WHO encourages the use of technologies such as artificial intelligence to tap the potential of traditional medicine. China Medical Museum is exploring digital construction, but faces the challenge of high content update and maintenance costs. For example, the Beijing Digital Museum of Traditional Chinese Medicine needs continuous investment to maintain its vitality.

Conclusion

The WHO's traditional medicine policy not only provides an international framework and standards for Chinese medical museums, but also promotes their transformation from a single cultural display to a comprehensive academic, educational and international cooperation platform by emphasizing evidence-based research, cultural diversity and public education. In the future, with the release of the WHO's new strategy and the deepening of cooperation with the China Medical Museum Alliance, the cultural value and scientific connotation of traditional medicine will be further disseminated globally through museums. The spiritual connotation and contemporary value of contemporary medical museums are constantly enriched and extended. Allowing the whole people to participate in and integrate into the construction of medical museums will help promote the implementation of China's "2035 Museum Power Strategy".

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3.1~7岁儿童急性脑供血不足呼吸频率昼夜节律

**CIRCADIAN RHYTHM OF RESPIRATORY RATE IN ACUTE
CEREBRAL INSUFFICIENCY IN CHILDREN AGED 3.1-7 YEARS**

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摘要。3.1-7岁急性脑梗死肺炎患儿自主呼吸时，心血管系统功能、自主神经调节和PMC直接取决于全身炎症反应的严重程度以及呼吸系统通气和非呼吸功能代偿活动的充分性。在机械通气期间，所研究的血流动力学参数昼夜节律中值之间的所有相关性均急剧减弱或消失。RR平均昼夜节律与血流动力学平均昼夜节律参数AVT、T、PMC之间的相关性增强至统计学上显著水平，反映了重症患者在没有硬件通气支持的情况下，代偿适应机制明显启动的状态，表明肺部和整个呼吸系统的通气活动正在恢复。第1组中，呼吸功能与其他系统的平均昼夜节律呈不显著的中度至弱相关性，表明在较轻程度的急性脑梗死（ACI）情况下，呼吸系统和非呼吸系统的代偿活动无需产生应激性张力。

关键词：呼吸频率昼夜节律，急性脑衰竭，儿童。

Abstract. *In spontaneous breathing of children with pneumonia complicated by ACI at the age of 3.1-7 years, the functions of the cardiovascular system, autonomic regulation, and PMC were directly dependent on the severity of the systemic inflammatory response and the adequacy of the compensatory activity of the ventilatory and non-respiratory functions of the respiratory system. All correlations of the mesors of circadian rhythms of the studied hemodynamic parameters sharply weakened or disappeared during mechanical ventilation. Strengthening to a statistically significant level of correlations of the average circadian rhythm of RR with the parameters of average circadian rhythms of hemodynamics, AVT, T, PMC reflected the state when severe patients without*

hardware ventilation support experienced a pronounced mobilization of compensatory-adaptive mechanisms indicating the restoration of the ventilatory activity of the lungs and the respiratory system as a whole. Insignificant moderate and weak correlations of the average circadian rhythm of the respiratory function and other systems in group I indicated the absence of the need for stressful tension of the compensatory activity of the respiratory and non-respiratory systems in conditions of less severe ACI.

Keywords: *circadian rhythm of respiratory rate, acute cerebral failure, children.*

Relevance. When studying the problem of respiratory therapy for acute cerebral failure, the main attention is paid to resolving two issues: the effect of various modes of artificial ventilation (hyper, normoventilation) and various breathing methods (spontaneous breathing, controlled mechanical ventilation, synchronized auxiliary ventilation and high-frequency jet ventilation) on cerebral hemodynamics. Based on the study of cerebral blood flow in patients with acute cerebral insufficiency (2-11 points on the Glasgow scale), including traumatic brain injury, strokes, toxic-metabolic damage, and post-hypoxic encephalopathy, the authors did not find a significant vascular effect, which is usually attributed to hyperventilation. There are no recommendations for using this mode in intensive care programs, especially since hypocapnia itself is accompanied by very serious negative effects. This alkalosis, which invariably accompanies hypocapnia, leads to hypokalemia with all its negative hemodynamic effects. The results of the studies allow us to assert that the causes of cerebral blood flow disorders in patients with acute cerebral insufficiency, in whose complex therapy artificial ventilation was used, are not associated with the gas composition of the blood, but depend on other causes. Perhaps they are due to the peculiarities of the biomechanics of breathing during artificial ventilation. In the CMV variant, conditions arise when, with virtually no autoregulation of cerebral blood flow and little influence of systemic hemodynamics on it, cerebral circulation remains unprotected from various fluctuations in systemic hemodynamics. The authors do not recommend the use of this variant of respiratory support in patients with cerebral insufficiency. The SIMV variant occupies an intermediate position between HF ALV and CMV in its cerebrovascular effects. The advantage of this variant is the preserved autoregulation of cerebral circulation. Apparently, the biomechanical effects of spontaneous ventilation, which is present in this variant, somehow had an effect. And although SIMV does not reliably differ from CMV in terms of numerical values of cerebral blood flow parameters, the presence of preserved autoregulation of cerebral hemodynamics in this ventilation variant makes it more preferable in comparison with the CMV mode. In the absence of the possibility of maintaining spontaneous

breathing (convulsive syndrome, pathological variants of spontaneous breathing), it is necessary to provide respiratory support in the CMV variant under conditions of deep sedation or the use of muscle relaxants, since none of the existing variants of mechanical ventilation, even high-frequency mechanical ventilation, ensures synchronization of the patient with the respirator [1-4]. The lack of recommendations for mechanical ventilation in children with acute cerebral insufficiency prompted us to conduct this study.

Objective. To study and evaluate changes in the circadian rhythm of respiratory rate in acute cerebral failure in children aged 3.1-7 years. Material and methods of the study. The results of continuous prolonged monitoring with hourly recording of hemodynamic parameters, myocardial oxygen demand (MOD), body temperature, and respiration were studied in children admitted to the ICU of the RRCM in a serious condition caused by pneumonia complicated by acute respiratory and cerebral failure at the age of 3.1 to 7 years. Intensive care was carried out in accordance with the recommendations in thematic clinical protocols. Group 1 included 7 children who, upon admission to the clinic and throughout intensive care, had no indications for mechanical respiratory support, which did not exclude oxygen therapy. The research data were processed by the method of variation statistics using the Excel program by calculating arithmetic means (M) and errors of means (m). To assess the reliability of differences between two values, the parametric Student's criterion (t) was used. The relationship between the dynamics of the studied parameters was determined using the paired correlation method. The critical significance level was taken to be 0.05.

Results and discussion. Group 1 included 7 children who had no indications for mechanical respiratory support upon admission to the clinic and throughout intensive care. The dynamics of the percentage of children in the ALV groups and children with spontaneous breathing is shown in Fig. 1. 70% of patients in Group 2 (7 children) were transferred to ALV according to indications from the moment of admission to the clinic.

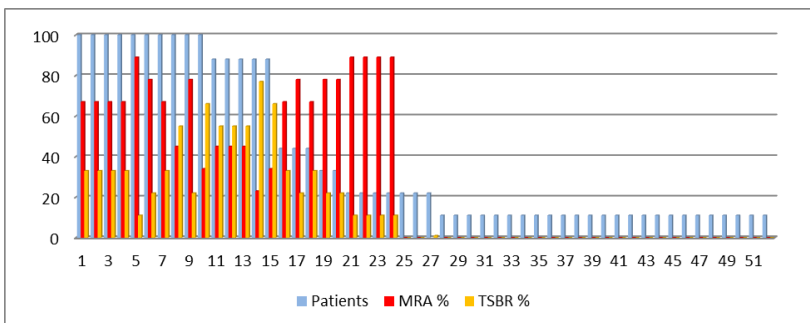


Figure 1. % ratio of children on artificial ventilation

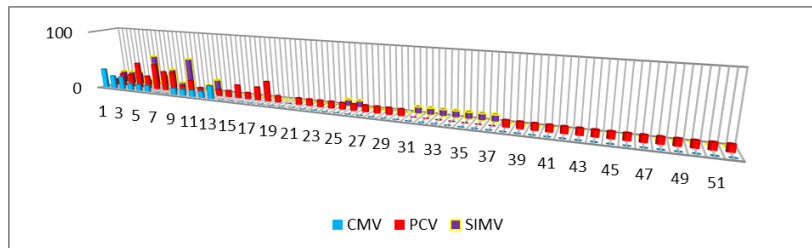


Figure 2. Режимы МПП в %.

In the first 7 days, the effectiveness of mechanical ventilation was achieved by using the PCV mode on days 3 and 6 in 40%, in 11% of children in group 2 during the entire stay in the ICU (52 days) due to severe appalachian syndrome. On days 1, 2, 3, preference was given to the CMV mode in 33%, 20%, 20% (respectively) during the acute period of traumatic disease of the first 12 days (Fig. 2).

Table 1

Average values of the phase structure of the circadian rhythm of the respiratory rate

Groups	Mesor	Acrophase	Batiphase	Amplitude	Daily range
1	29±3	34±7	27±2	5±3	7±2
2 (7 days)	34,5±1,9	41,1±4,4	29,9±1,6	6,6±3,3	11,3±5,3
2 (25 days)	29,6±5,1	34,8±5,8	25,3±5,1	5,0±2,2	9,2±3,6

The tendency to increased respiratory rate revealed in the 1st group of children was of a compensatory nature, given the numerous functions of the respiratory system in stress, pain, systemic inflammatory response, the role in detoxification, hemodynamic regulation of homeostasis in general, was due to the tension of the functional activity of organs and systems aimed at adapting the body in the acute period of traumatic disease. Due to the adequacy of this reaction, the absence of signs of dysfunction, depletion of compensatory resources, patients continued to breathe independently until they recovered from the severe condition associated with TCTBI. Only in the first 7 days was a tendency to an increase in the average value of the mesorum of the circadian rhythm of respiratory rate revealed in the 2nd group relative to the first by 18% ($p > 0.05$) (Table 1).

Table 2
Mesor circus of rhythm of RR

Days	1 gr	2 gr 25 days
1	35,3±3,0	36,3±4,2
2	32,7±1,2	37,7±2,3'''
3	29,9±0,4*	34,0±2,0'''
4	30,3±0,7*	32,4±1,3
5	28,2±1,1*	35,8±8,7
6	27,0±0,6*	30,5±1,1*
7	21,5±0,6*	35,1±1,7'''
8		30,7±3,0*
9		24,6±0,5*
10		22,5±1,0*
11		
12		31,8±2,8
13		35,4±2,4
14		33,2±2,0
15		30,2±2,2
16		28,5±1,0
17		40,0±1,2
18		26,3±3,8
19		32,6±0,9
20		27,5±1,3
21		20,8±3,3
22		21,8±1,5
23		19,6±1,6
24		21,7±3,7

Table 3
Average circadian rhythm of respiratory rate

Hours	1 group	2 group 7 days	2 group 25 days
8	30±3	36,7±3,8	30,1±6,2
9	30±3	35,5±4,4	30,6±6,3
10	29±3	36,6±5,2	30,6±5,5
11	29±3	37,3±5,4	30,4±5,6
12	30±4	37,2±6,7	30,9±5,9
13	29±3	37,5±5,5	30,5±6,1
14	30±4	36,4±5,9	30,6±5,4
15	30±4	33,4±3,4	30,2±4,7
16	30±3	33,3±3,7	29,5±4,2
17	29±3	35,1±2,7	29,7±4,9
18	29±3	35,8±2,0	29,9±5,3

19	29±3	34,8±2,3	29,9±5,1
20	29±3	32,7±2,7	30,5±4,2
21	29±3	33,3±2,1	29,2±4,2
22	29±3	32,1±3,1	29,1±4,9
23	29±3	32,2±2,7	29,2±5,1
24	29±3	33,8±3,5	28,8±5,7
1	28±3	33,6±3,3	28,6±5,6
2	31±7	33,3±3,3	27,9±6,1
3	28±3	33,3±3,1	27,9±5,5
4	29±3	33,2±2,4	27,6±5,8
5	29±3	33,0±2,4	27,9±5,2
6	29±3	33,1±2,5	28,6±5,5
7	29±3	33,2±2,3	29,5±5,0

*- the difference is reliable relative to the 1st day.

In the 1st group, a decrease in dyspnea by 15% was noted already on the 3rd day, by 14% on the 4th, by 19%, 23%, 38% on the 5th-7th days ($p<0.05$, respectively), which corresponded to the clinical improvement of the patients' condition (Table 2). The effectiveness of intensive care in the 2nd group was manifested by a decrease in the number of patients in the ICU on the 16th day to 4, by the 28th day there was 1 patient with severe acute cerebral insufficiency according to the Glasgow Coma Scale of 6 points. Due to the failure of spontaneous breathing, all 8 patients were on mechanical ventilation on the 11th day of treatment. A reliable significant decrease in respiratory rate on the 10th day by 38% (to the age norm) was due to the effect of stress-limiting therapy (Table 2). The transfer of 2 children to independent breathing on the 24th day in order to establish the adequacy of spontaneous breathing led to the need to continue mechanical ventilation for the next 2 days (Fig. 3).

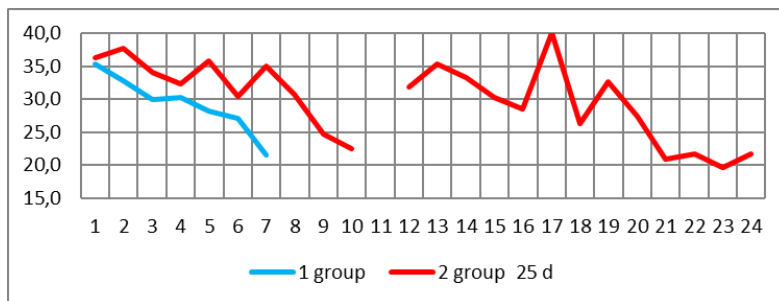


Figure 3. Mesozotic circadian rhythm of respiratory rate per minute.

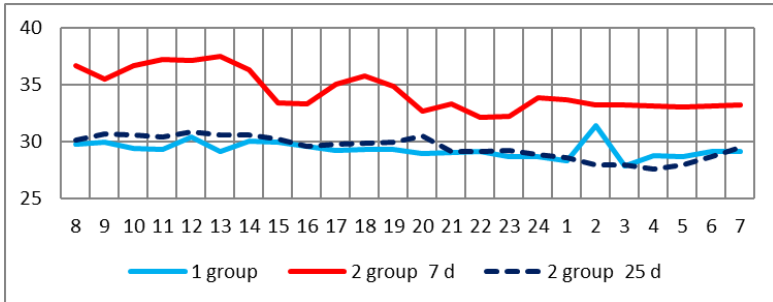


Figure 4. Average circadian rhythm of respiratory rate per minute.

Average circadian rhythm of respiratory rate in children of group 2 for 25 days almost did not differ from average circadian rhythm of respiratory rate in children of group 1. That is, sufficiently massive stress-protective therapy with the use of artificial ventilation, tranquilizers, hypnotics, muscle relaxants led to a decrease in protective compensatory reactions, reducing the level of mesor of average circadian rhythm of respiratory rate, amplitude, daily range of oscillations, shift of peak of acrophase during prolonged artificial ventilation in children. Of no small importance, apparently, is the hypercatabolic state, characteristic of the acute period of severe traumatic disease, invariably accompanied by depletion of energy resources due to the severity of traumatic injury, an array of damaged tissues, aggravating the uncomfortable conditions of increased functional activity at the cellular, organ level. In the first 7 days, the average circadian rhythm of the respiratory rate in the 2nd group was distinguished by a significantly higher level of the mesomorphic circadian rhythm of the respiratory rate by 17% ($p < 0.05$) relative to children in intensive care under conditions of spontaneous breathing. Underestimation of the severity of the condition of children with ARF led to the fact that on the 11th day, all injured patients in the 2nd group needed respiratory support. Repeated transfer to mechanical ventilation improved the condition of the patients,

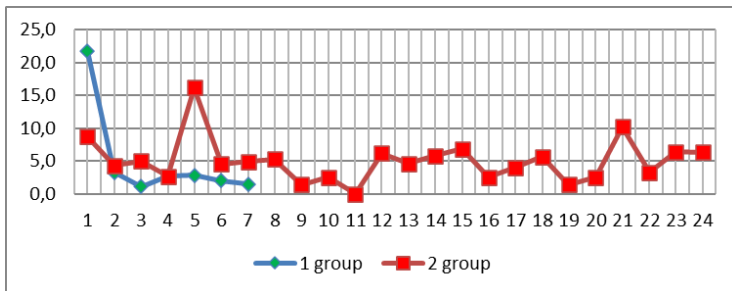


Figure 5. Amplitude of the circadian rhythm of respiratory rate per minute.

The stress reaction of the circadian rhythm of respiratory rate was expressed in an increase in the amplitude of the circadian rhythm of respiratory rate by 16 breaths per minute on the 5th day in the 2nd group (Fig. 4, 5). If we had taken into account the increase in the amplitude, the daily range of oscillations of the circadian rhythm of respiratory rate on the 5th day as a manifestation of unfavorable dynamics, preventive measures could have been taken (change in ventilation mode, sanitation of the TBD, anti-inflammatory therapy, etc.), which would have allowed us to avoid deterioration of the condition on the 10th day due to the restoration of adequate breathing.

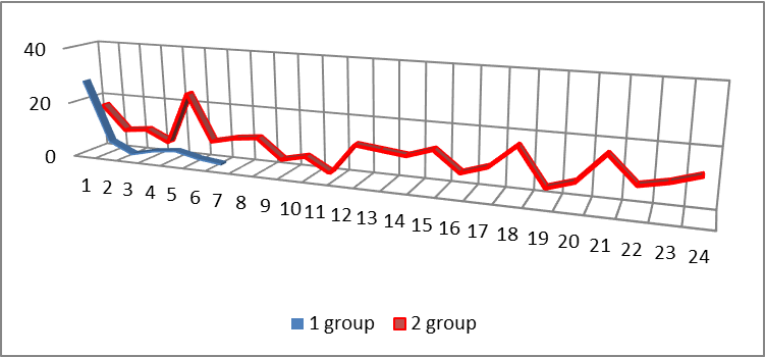


Figure 6. Daily fluctuations in respiratory rate per minute.

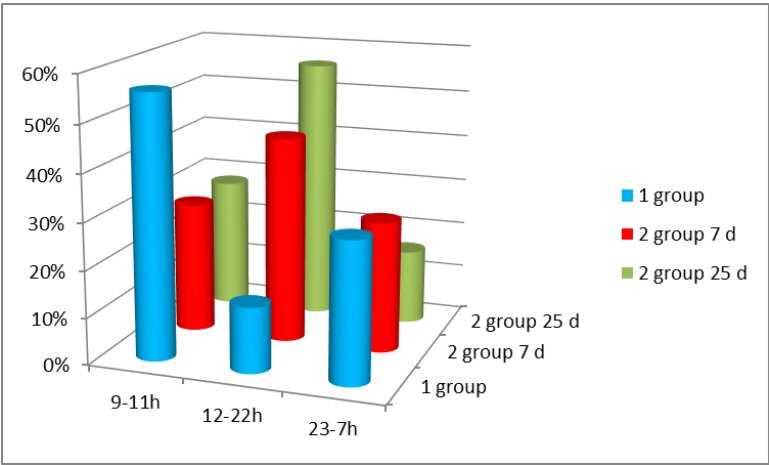


Figure 7. Duration of the inversion of the circadian rhythm of the respiratory rate

The physiological projection of the acrophase of the circadian rhythm of the respiratory rate was found in 55% (4) of the children in group 1, the inversion of the circadian rhythm of the respiratory rate was observed in 16% (4) of the patients in group 2. In most severely ill children, a moderate shift in the peak of the acrophase within the daytime prevailed for 17 days, which reflected the stress-protective nature of the complex intensive therapy for ACI.

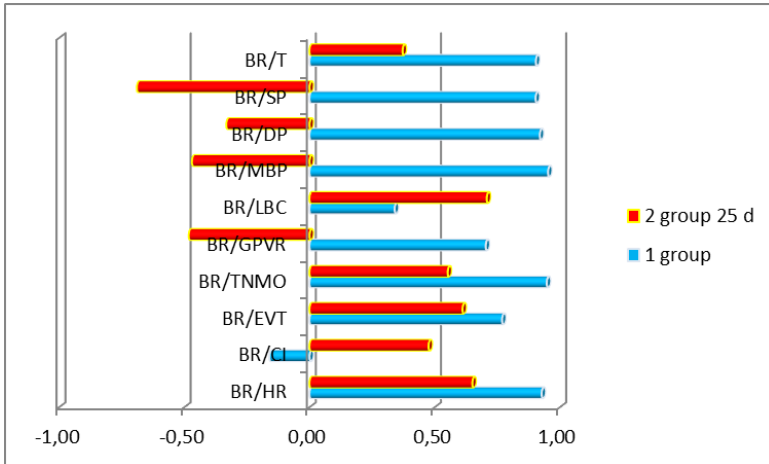


Figure 8. Correlation links of the circadian rhythm mesor of respiratory rate.

All subjects of group 1 showed a direct strong dependence of HR (0.93), OVT (0.77), PMC (0.95), TPR (0.77), MAP (0.95), DBP (0.92), SBP (0.9) on changes in respiratory rate. The circadian rhythm mesor of respiratory rate was in a direct strong relationship with the circadian rhythm mesor of body temperature (0.9). In connection with the revealed features, it can be said that in group 1, the functions of the cardiovascular system, autonomic regulation, PMC were in a direct dependence on the severity of the systemic inflammatory response in group 1 and the adequacy of the compensatory activity of the ventilatory and non-respiratory functions of the respiratory system (Fig. 8). All of the listed correlation links sharply weakened or disappeared during mechanical ventilation.

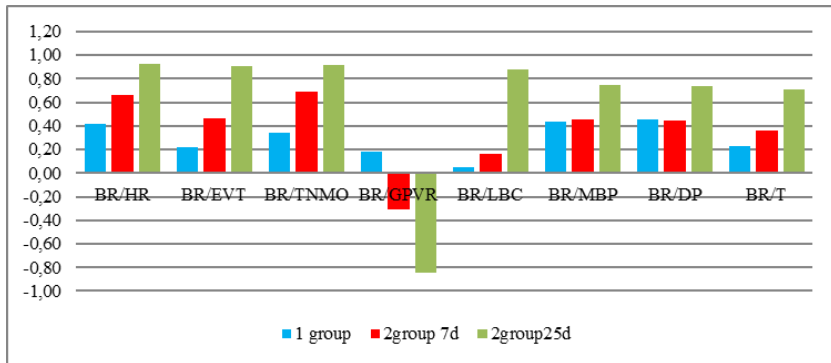


Figure 9. Correlation relationships of the average circadian rhythm of respiratory rate.

It is noteworthy that all correlation relationships of the average circadian rhythm of respiratory rate with the parameters of average circadian rhythms of hemodynamics, AVT, T, and MVP have increased to a statistically significant level, which apparently reflects the state when severe patients of group 2 were without hardware ventilation support; there was a pronounced mobilization of compensatory-adaptive mechanisms indicating the restoration of the functional activity of the lungs and the respiratory system as a whole. Insignificant moderate and weak correlation relationships of the average circadian rhythm of respiratory function and other systems in group 1 indicate the absence of the need for stressful tension of the compensatory activity of non-respiratory systems in conditions of less severe OCI.

Conclusion. In group 1, the functions of the cardiovascular system, autonomic regulation, and MVP were directly dependent on the severity of the systemic inflammatory response. All the listed correlations of the mesors of circadian rhythms of the studied parameters sharply weakened or disappeared during artificial ventilation. Strengthening to a statistically significant level of correlations of the average circadian rhythm of respiratory rate with the parameters of average circadian rhythms of hemodynamics, AVT, T, PMC, apparently reflected the state when severe patients of group 2 were outside the hardware ventilation support, there was a pronounced mobilization of compensatory-adaptive mechanisms indicating the restoration of the functional activity of the lungs and the respiratory system as a whole. Insignificant moderate and weak correlations of the average circadian rhythm of the respiratory function and other systems in group 1 indicate the absence of the need for stress tension of the compensatory activity of non-respiratory systems in conditions of less severe OCI.

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不合理拔牙的原因和后果
**CAUSES AND CONSEQUENCES OF UNJUSTIFIED TOOTH
EXTRACTION**

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摘要: 不合理拔牙是牙科领域最紧迫、讨论最多的话题之一,在专家和患者中引发了广泛的争议。如果有拔牙指征,拔牙无疑是必要的。尽管现代技术和治疗方法即使在最棘手的情况下也能保留牙齿,但近年来,患者拔牙的需求却日益增多。该话题的相关性源于多种因素,包括牙医资质不足、经济利益,以及不遵守治疗方案的不当使用。因此,不合理拔牙是一个亟待解决的问题,需要牙科界的关注。基于对现代文献的分析,有必要找出不合理拔牙的原因,并评估其对患者健康的影响。

关键词: 拔牙,拔牙后果,牙齿保存,康复,拔牙指征,资源节约,患者健康,拔牙后并发症,牙齿康复,不合理拔牙。

Abstract. *Unreasonable tooth extraction is one of the most pressing and discussed topics in the field of dentistry, which causes a wide range of opinions among both specialists and patients. Tooth extraction is certainly a necessary procedure if there are indications for extraction. Despite the fact that modern technologies and treatment methods allow preserving teeth even in the most difficult cases, in recent years there has been an increasing number of patient requests for tooth extraction. The relevance of the topic is due to several factors, ranging from insufficient qualifications of the dentist, financial interests and ending with improper use of treatment protocols, not following their rules. Thus, unjustified tooth extraction is a pressing problem that requires attention from the dental community. Based on the analysis of modern literature, it is necessary to identify the causes of unjustified tooth extraction and assess its consequences for the health of patients.*

Keywords: *tooth extraction, consequences of extraction, tooth preservation, rehabilitation, indications for tooth extraction, resource conservation, patient health, complications after extraction, dental rehabilitation, unjustified tooth extraction.*

Modern dentistry is developing rapidly, and today it is possible to save even a seemingly hopeless tooth. And only if the obvious advantages of extraction outweigh the disadvantages, the doctor will prescribe surgery. In order to understand what exactly is meant by unjustified tooth extraction, you need to refer to the existing standards for the provision of surgical dental care to determine what criteria are used to make a decision on tooth extraction.

Indications for tooth extraction surgery are divided into absolute and relative. Absolute indications, in turn, are divided into:

- urgent, in which the tooth must be extracted at the first time the patient seeks help. Such indications include: 1) Teeth that are a source of odontogenic infection such as: odontogenic phlegmon of the perimaxillary soft tissues. 2) Teeth located in the fracture line, having foci of acute or chronic infection in the periapical tissues that interfere with reposition of fragments or having a root fracture (root). 3) Teeth in the acute stage or exacerbation of chronic inflammatory process in the periapical tissues when endodontic treatment is impossible. 4) Longitudinal root fracture. 5) Dystopic, impacted or semi-impacted teeth that are a source of acute odontogenic infection such as: pericoronitis, periostitis of the jaws, odontogenic maxillary sinusitis, osteomyelitis of the jaws, abscesses and phlegmons of the perimaxillary soft tissues. 6) Dystopic, impacted or semi-impacted teeth with acute or exacerbation of chronic inflammatory processes in the periapical tissues. 7) Dystopic, impacted or semi-impacted teeth that cause caries, pulpitis, periodontitis of adjacent teeth. 8) Dystopic, impacted or semi-impacted teeth that are a source of acute mechanical trauma.

Elective – indications for which the tooth must be extracted, however, the tooth extraction operation can be postponed for a certain time: 1) Change of bite. 2) Orthopedic indications. 3) Dystopic, impacted or semi-impacted teeth that are a source of chronic mechanical trauma to the oral mucosa. 6) Dystopic, impacted or semi-impacted teeth that are a source of radicular, follicular cysts, eruption cysts, retromolar cysts. 7) Teeth with foci of chronic odontogenic infection in patients with chronic sepsis, pericarditis, renal amyloidosis.

Relative indications for tooth extraction: 1) Failure of endodontic treatment of chronic foci of periapical infection (chronic granulating and granulomatous periodontitis) due to: – obstruction of the root canal with a broken endodontic instrument and the impossibility of its removal; – anatomical features (obstruction or significant curvature of the root canals, presence of denticles); – treatment errors that caused perforation of the root or cavity of the tooth, if these obstacles cannot be eliminated. 2) Teeth with frequent exacerbations of chronic periapical infection when endodontic treatment is impossible. 3) Teeth with bone resorption of more than 2/3 of the root length, mobility of grades II-III. 4) Transverse fracture of the tooth root. 5) Teeth that are a source of odontogenic infection such as: per-

iostitis, osteomyelitis, lymphadenitis, maxillary sinusitis, odontogenic abscesses of the perimaxillary soft tissues. 6) Teeth that have changed their position due to the absence of adjacent teeth or antagonists (Popov-Godon phenomenon). 7) Teeth localized in the area of a benign neoplasm of the alveolar process, which are subject to removal simultaneously with the neoplasm. 8) Dystopic retained or semi-retained teeth that do not cause pathological conditions in the oral cavity and dentoalveolar system.

Contraindications to tooth extraction. There are absolute and relative (local and general) contraindications to tooth extraction.

Absolute contraindications: 1) Teeth localized in the area of a malignant neoplasm, which are subject to removal simultaneously with the neoplasm. Relative contraindications. Relative contraindications include a number of general and local diseases and some physiological conditions. In such patients, this intervention can only be performed after appropriate treatment or preparation. Relative contraindications to tooth extraction surgery are divided into general and local.

General contraindications: 1) Cardiovascular diseases in the sub- and decompensation stage (pre-infarction condition and 3-6 months after myocardial infarction, hypertension during a crisis, ischemic heart disease with frequent attacks of angina pectoris, paroxysmal atrial fibrillation, paroxysmal tachycardia, acute septic endocarditis, etc.). 2) Acute diseases of the parenchymatous organs - liver, kidneys, pancreas (infectious hepatitis, glomerulonephritis, pancreatitis, etc.). 3) Hemorrhagic diathesis (hemophilia, Werlhof's disease, Savitaminosis); diseases that occur with hemorrhagic symptoms (acute leukemia, agranulocytosis). 4) Patients regularly taking drugs that affect blood clotting. If this operation is urgently needed, measures should be taken to prevent subsequent bleeding. Surgery is recommended to be performed only in a hospital setting. If there are no indications for urgent intervention, preliminary preparation of the patient should be carried out for a certain period. 4) Acute infectious diseases (flu, acute respiratory diseases, erysipelas, pneumonia, etc.). 5) Diseases of the central nervous system (acute cerebrovascular accident, meningitis, encephalitis, etc.). 6) Mental illnesses during exacerbation (schizophrenia, manic-depressive psychosis, epilepsy, etc.). 7) Acute radiation sickness stages I-III. 8) Pregnancy (1-2 and 8-9 months due to the risk of miscarriage or premature birth).

Local contraindications: 1) Ulcer-necrotic diseases of the oral mucosa. 2) Viral infections of the oral cavity (herpetic stomatitis, cheilitis). 3) Radiation therapy, which is carried out for malignant diseases of the maxillofacial localization; 4) Deciduous teeth in adults in the absence of rudiments of permanent teeth. After corrective treatment of these patients, stabilization of their condition and consultation with a specialist in the appropriate profile, it is possible to perform a tooth extraction operation. For patients with severe concomitant pathology, tooth extraction is recommended to be performed in a hospital setting.

Possible causes and factors that can lead to unjustified tooth extraction, that is, without sufficient medical indications:

1. In orthopedic treatment, when doctors are initially mistaken and make the wrong decision to extract a tooth and refer the patient to a dental surgeon, although there is another, more conservative treatment option.
2. Earning money without encumbrances (prosthetics, implantation, psychological influence of a dentist on a patient).
3. Earning money with encumbrances (psychological influence of a dentist on a patient, a dentist can recommend tooth extraction to simplify his work or increase profits from dental procedures, since he has debt: a loan, a mortgage).
4. A doctor's error based on a mistake (inexperience of a dentist and insufficient clinical experience, lack of necessary knowledge and skills to make a decision on extraction or preservation)
5. Convincing a doctor by a patient, psychological influence on him in order to extract a healthy or non-extractable tooth under some pretext. Patients may insist on the removal of teeth that they consider unaesthetic, even if they are healthy and perform their function, unreasonable pain in the tooth, discomfort, as a result of which the patient wants to remove it. This problem is especially common in public dental clinics, where elderly and old people seek help in most cases with a request that the dentist perform a tooth extraction under the pretext of lack of money, refusal of conservative types of treatment (therapeutic and orthopedic), under the pretext of acute pain from caries and its complications.
6. Fear of complex cases (dentists may avoid complex cases related to the preservation of teeth due to lack of experience or lack of confidence in their abilities).
7. Unscrupulous goals of doctors (a very rare reason, consisting in intentional impact on the tooth with the purpose of its destruction and subsequent removal, some interaction of doctors of several specialties)

Unreasonable tooth extraction may entail high financial costs for subsequent treatment. Restoring lost teeth may require the installation of implants, bridges or dentures, which are expensive procedures. These financial costs may become a burden for patients, especially if they were not prepared for such expenses. Moreover, it is not always possible to restore lost teeth, and in some cases, patients may be faced with the need to live without teeth, which leads to additional inconveniences and problems. An important aspect is also the impact of tooth extraction on the occurrence of general and local complications, and on the general health of the patient. Research shows that oral health is closely related to the general health of the body. For example, gum disease and tooth loss can be associated with an

increased risk of cardiovascular disease, diabetes and other chronic diseases. This emphasizes the importance of preserving teeth and the need for careful diagnosis before making a decision to remove them. It should also be noted that in some cases, unjustified tooth extraction can lead to the need for complex and lengthy rehabilitation measures. This requires time, resources and patience from the patient.

Unreasonable tooth extraction can also negatively affect the patient's quality of life. Missing teeth can make it difficult not only to chew, but also to perceive the taste of food, which can make eating less enjoyable. Patients may begin to avoid social events where eating is involved, which can lead to social isolation. In addition, speech problems can make it difficult to communicate, which also affects the quality of life and social activity.

Thus, unjustified tooth extraction is a serious problem that affects not only the physical health of patients, but also their psychological state. The consequences of such intervention can be very severe and varied. Firstly, tooth loss can lead to disruption of chewing function, which in turn negatively affects digestion and the general condition of the body. In addition, tooth extraction causes changes in the bite, which can lead to further problems with teeth and jaws. Often, patients are faced with the need to install dentures or implants, which requires significant financial costs and time for recovery. Psychological consequences should not be underestimated either. Many people associate tooth loss with loss of attractiveness and self-confidence. This can lead to social problems, such as communication difficulties and a decrease in quality of life. Factors such as shame, isolation and low self-esteem can become constant companions of a person who has experienced an unjustified tooth extraction. It is important to note that such consequences can be not only short-term, but also long-term, affecting the psycho-emotional state of patients for many years.

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巴什科尔托斯坦共和国阿布泽利洛夫斯基地区新铜矿开发过程中的生态卫生因素
及公共卫生风险

**ECOLOGICAL AND HYGIENIC FACTORS AND RISKS TO
PUBLIC HEALTH DURING THE DEVELOPMENT OF A NEW
COPPER DEPOSIT IN THE ABZELILOVSKY DISTRICT OF THE
REPUBLIC OF BASHKORTOSTAN**

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摘要: 巴什科尔托斯坦共和国东南部地区的矿床和矿山开采企业,其特点是自然和人为因素共同作用,形成了一系列不利的卫生化学和生态卫生因素。因此,不仅外乌拉尔地区发达的农业工业部门(土地化学化、大型畜牧业和林业综合体建设)对环境状况造成了重大影响,而且采矿企业的生产活动也对环境状况产生了重大影响。为了开展经济论证项目并澄清现有约229公顷土地的数据,俄罗斯联邦伏尔加河沿岸联邦区地下资源利用部向萨拉瓦茨科耶有限责任公司颁发了至2025年底的地质勘探许可证。采矿业的矿石开采、富集和加工过程主要通过重金属(HM)污染这些地区的水生生态系统,这些重金属随后进入这些物质的循环:“水体-底部沉积物-植物群-鱼类-人类”。重金属由于未充分净化或完全未净化的矿井水、地层水、排土场水和矿井水的排放而进入水体。

关键词: 萨拉瓦茨铜矿床, 巴什科尔托斯坦共和国, 阿布泽利洛夫斯基区, 生态和卫生因素, 居民健康风险。

Abstract. Mining deposits and operating enterprises in the southeastern territories of the Republic of Bashkortostan (RB) are characterized by a combination of natural and man-made impacts of the entire complex of unfavorable sanitary-chemical and ecological-hygienic factors. Thus, a significant contribution to the state of environmental objects is made not only by the developed agro-industrial sector of the Trans-Urals with chemicalization of lands, construction of large livestock and timber industry complexes in these areas, but also, first of all, by the

production activities of mining enterprises. In order to develop a project for the economic justification and to clarify the available data on an area of approximately 229 hectares, the Department of Subsoil Use of the Volga Federal District of the Russian Federation issued Salavatskoye LLC a license to conduct geological exploration until the end of 2025. The processes of extraction, enrichment and processing of ore in the mining industry primarily pollute the aquatic ecosystems of such territories with heavy metals (HM), which are then included in the cycle of these substances: "water bodies - bottom sediments - phytomass - fish - humans". HM enter water bodies due to the discharge of insufficiently purified or completely unpurified mine, formation, underdump and mine waters.

Keywords: *Salavat copper deposit, Republic of Bashkortostan, Abzelilovsky district, ecological and hygienic factors, health risks for the population.*

Relevance. The health status and morbidity of the population of the Russian Federation (RF) living in the republics and individual regions with intensively developed mining industry currently require more attention from preventive medicine and remains higher. Long-term development and exploitation of mineral deposits in the Trans-Urals of the Republic of Bashkortostan are accompanied by significant adverse effects on all environmental objects. Extraction and processing of various ores leads primarily to the pollution of surface water bodies with heavy metals. According to the data of the annually conducted social and hygienic monitoring, the territory of the Republic of Bashkortostan, especially the south-eastern regions, are considered to be at risk in terms of the level of general morbidity of the adult and child population, including diseases of the respiratory system, digestion and genitourinary system. Also, in the structure of morbidity of these territories, the most pronounced and above the average national indicators are neoplasms and diseases of the circulatory system [1, 2].

The purpose of the study and publication is that the planned future mining of copper and zinc ore in the Abzelilovsky district of the Republic of Bashkortostan (with a population of about 45 thousand people) through certain above-mentioned actions of the Russian Copper Company has caused an ambiguous reaction from some residents of settlements adjacent to the deposit. The main questions of residents remain about the future state of the ecology in the district and the republic as a whole, the preservation of rivers and the future of the deepest lake in the Republic of Bashkortostan, Yaktykul (Bannoe), with a depth of up to 28 m and a tectonic origin of the basin. In terms of water reserves, the lake ranks third in the Republic of Bashkortostan, yielding the first two places to lakes Aslykul and Kandrykul, which have significantly larger areas.

Results and discussion. Currently, the mining enterprises of our region have already accumulated more than one billion tons of production and mining waste,

which includes waste rock and substandard ores. The Baimak Copper and Sulfur Plant has accumulated more than 500 million tons of such waste, the Uchaly Mining and Processing Plant (MPP) more than 300 million tons, and the Buribaevsky GOK more than 10 million tons. The annual volume of such waste from mining enterprises averages 40-45% of all waste in the region [3].

Our long-term studies have shown that water from centralized water supply sources in the main cities and towns of the mining areas of the Republic of Belarus generally meets current hygienic requirements. At the same time, analyses of drinking water samples from non-centralized sources in these areas are characterized by increased hardness, high content of cadmium, hexavalent chromium, calcium, iron and nitrates [4, 5].

The results of the assessment of organoleptic, non-carcinogenic and carcinogenic risks associated with the constant use of drinking water in such territories of the Republic of Belarus convincingly and reliably indicate the possible influence of water sources on living conditions, morbidity and health of the population. Thus, the population of the mining territories of the Republic of Belarus with the constant use of water from non-centralized water supply sources may be exposed to the risk of developing various neoplasms. The highest levels of carcinogenic risk are in the settlement of Slantsy and the village of Azikeevo in the Beloretsk district, as well as in the villages of Tashbulatovo and Baimovo in the Abzelilovsky district (up to 10-12 additional cases of malignant neoplasms per 10 thousand people are possible). The carcinogenic risk in the above-mentioned areas is due to the increased content of hexavalent chromium and benzo(a)pyrene in the water. It is well known that the following heavy metals are found in the waste of the above-mentioned and other mining and processing enterprises: arsenic, lead, zinc, copper, manganese, mercury, cadmium, chromium, etc.

Wastewater is formed at all stages of the technological process of mining and quarrying. These wastewaters can be defined by origin into groups, where more than 90% of the volume of wastewaters are mine and quarry. They contain suspended matter (inorganic dust) from drilling and blasting operations, stripping and mining operations. Due to fuel and oil spills, there are petroleum products and emulsions, as well as iron, nitrites and nitrates due to explosives.

The existing excess of standards for water bodies and almost all types of water use create a potential and inevitable danger to the health of the population of the mining territories of the Republic of Belarus. The data obtained are consistent with the studies of numerous other authors and can be used in developing a set of preventive measures and recommendations for further provision of the population of mining territories with high-quality drinking water and further improvement of the living environment.

Conclusion. Back in the 50s and subsequent years of the last century, up to 40 wells were drilled in geological surveys on the territory of the Salavat copper deposit in the Abzelilovsky district of the Republic of Bashkortostan and predicted resources of up to 208 million tons of ore with a copper content of no more than 1% and 1 million tons of copper were determined. It was then decided to mothball this deposit for the future. This decision was correct and justified from an economic point of view, which was also due to the absence of new combined (flotation in combination with gravity enrichment units) enrichment technologies in those years, the discovery in the 60-90s of more profitable above-mentioned deposits in the Trans-Urals and other regions of the Russian Federation. All these circumstances did not allow for more than 70 years to begin developing this deposit.

In order to develop a project for economic justification and to clarify the available data on an area of approximately 229 hectares, the Department for Subsoil Use of the Volga Federal District of the Russian Federation issued Salavatskoye LLC (actually Russian Copper Company - RMC) a license to conduct geological exploration work until the end of this year. If the data on reserves is confirmed and the expert opinion of Glavgosexpertiza is positive, then the reserves of copper, zinc and other strategic raw materials will be put on the state balance sheet with decisions being made on the start of quarry development and the construction of a mining and processing plant in 2027-2029.

Thus, the attraction of investors RMK, future tax revenues, economic and environmental attractiveness of this project generate interest of the Republic of Bashkortostan and the Trans-Urals regions in the development of the deposit. In connection with the above circumstances, the following urgent management decisions and conclusions arise and require mandatory resolution:

- the ecological, hygienic and environmental situation in the south-eastern municipal districts of the Republic of Bashkortostan, and in the Trans-Urals as a whole, remains tense and conflict-ridden;

- regional authorities at all levels need to organize full control of this situation by coordinating with the relevant federal and republican structures (Rosprirodnadzor, Rospotrebnadzor, etc.);

- serious explanatory work and a competent presentation of the ecological, socio-economic and medical-demographic advantages of further promotion and improvement of this project in the Abzelilovsky MR of the Republic of Bashkortostan are needed with the population and public organizations at the local level;

- we consider it appropriate in 2025-2027 to conduct expanded and more in-depth studies by research institutes of Rospotrebnadzor, the Russian Academy of Sciences and the Academy of Sciences of the Republic of Bashkortostan based on data on real exposure loads to which the population and workers of mining areas and enterprises of the Republic of Bashkortostan and neighboring regions of the Russian Federation are or will be exposed;

- to hold public hearings for all residents of the Abzelilovsky municipal district and the entire region with a presentation of this project at all stages of its implementation in 2025-2030.

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2 型糖尿病患者缺血性卒中病程的特异性
**SPECIFICITY OF THE COURSE OF ISCHEMIC STROKE IN
INDIVIDUALS WITH TYPE 2 DIABETES MELLITUS**

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摘要：本文介绍了2型糖尿病（DM 2）患者缺血性卒中的临床病程。本研究旨在比较分析2型糖尿病患者和无碳水化合物代谢紊乱患者的神经系统症状、血糖控制参数、脂质代谢以及微观和宏观血流变学参数的状态。研究纳入了40名患者，分为主要组和对照组。所得数据表明，2型糖尿病患者的卒中病程更为严重，表现为严重的局灶性神经系统症状、较高的糖化血红蛋白（HbA1C）水平、脂质谱紊乱以及血液流变学特性下降。2型糖尿病患者的功能恢复程度较低，卒中后恢复期较长。研究结果强调，早期诊断和纠正代谢紊乱至关重要，以降低此类患者发生严重血管并发症的风险。

关键词：缺血性卒中，2型糖尿病，高血糖，内皮功能障碍，微循环，血液流变学。

Abstract. The article presents a study of the clinical course of ischemic stroke in patients with type 2 diabetes mellitus (DM 2). The aim of the work was a comparative analysis of neurological symptoms, glycemic control parameters, lipid metabolism, as well as the state of micro- and macrorheological parameters in patients with ischemic stroke suffering from DM 2 and patients without carbohydrate metabolism disorders. The study included 40 patients divided into the main and control groups. The data obtained indicate a more severe course of stroke in the presence of DM 2, which is manifested by severe focal neurological symptoms, higher HbA1C levels, lipid profile disorders and decreased rheological properties of the blood. Patients with DM 2 had a lower degree of functional recovery and a longer post-stroke period. The results emphasize the need for early diagnosis and correction of metabolic disorders to reduce the risk of severe vascular complications in this category of patients.

Keywords: *ischemic stroke, type 2 diabetes mellitus, hyperglycemia, endothelial dysfunction, microcirculation, hemorheology.*

Relevance. Strokes occupy leading positions among the causes of primary disability and mortality in the general structure of morbidity. In the Republic of Tajikistan, cerebrovascular diseases are the third leading cause of death - both among diseases of the circulatory system (39%) and in the total number of deaths (23.4%) [1]. According to forecasts of the World Health Organization, by 2030, cardiovascular catastrophes, including strokes, will cause the death of about 23.3 million people [2]. Among the key factors provoking ischemic cerebrovascular accidents (ICAD), a number of conditions can be distinguished that accelerate the development of the disease, contribute to a more rapid increase in symptoms and increase the risk of complications. It has been proven that carbohydrate metabolism disorders, especially type 2 diabetes mellitus (T2DM), play a significant role in the pathogenesis of ischemic stroke (IS), increasing the severity of clinical manifestations, increasing the risk of relapse over the next 10 years and increasing mortality in the development of stroke [3]. In type 2 diabetes mellitus (T2DM), hyperglycemia, insulin resistance and concomitant hyperinsulinemia are key mechanisms that accelerate vascular wall damage, the development of atherosclerosis and thrombotic complications, which contributes to high mortality from cardiovascular diseases. A significant role of T2DM in the development of cerebral infarction of atherothrombotic origin, as well as in a more severe and aggressive course of the acute period of stroke has been established. In the pathogenesis of ischemic cerebral circulation disorders, disorders of the hemorheological properties of blood, hemostasis and fibrinolysis are of great importance. Early manifestation of endothelial dysfunction is considered as one of the key factors contributing to the development of complications in type 2 diabetes, including ischemic stroke. The state of microcirculation in the affected areas of the brain, and, consequently, the clinical course of stroke, largely depend on the degree of activation of blood cells and endothelium. Unidirectionality and mutual enhancement of morphofunctional changes in ischemic stroke (IS) contribute to further aggravation of disorders at the level of microcirculation [4]. Dyslipoproteinemia has a pronounced pathological effect on the endothelium, a key barrier organ, disrupting the physiological balance between vasodilator, antithrombotic, anti-inflammatory and anti-sclerotic factors on the one hand, and vasoconstrictor, proliferative, inflammatory and prothrombotic factors on the other, with the latter dominating. In this context, the modern concept that endothelial dysfunction plays a central role in the development and progression of atherothrombosis in patients with type 2 diabetes is of particular importance. However, data on the state of the hemostasis system and hemorheological parameters in patients with ischemic stroke and type

2 diabetes remain contradictory and require further clarification. Studies devoted to the effect of endothelial dysfunction on the course of ischemic stroke in patients with type 2 diabetes are few and mainly describe clinical cases in the presence of complete metabolic syndrome. Given the significant role of these pathological changes in the pathogenesis and prognosis of ischemic stroke, this problem remains relevant and requires further study [4].

Objective of the study. To analyze the specifics of the course of ischemic stroke in patients with type 2 diabetes mellitus.

Materials and methods of the study. The study was conducted in the Department of Neurology of the State Institution “GMC No. 1 named after K. Akhmedov” in Dushanbe. The study included 21 patients with ischemic stroke, whose average age was 60.2 ± 2.2 years. Patient complaints, anamnesis data, history of diabetes and hypertension were taken into account. Biochemical blood and urine tests were performed on all patients without exception. The levels of glycemia and glycated hemoglobin (HbA1C), weight, height of patients were clarified, the body mass index was calculated. Lipid metabolism and platelet indices were determined. Of the instrumental research methods, ECG, EchoCG and magnetic resonance imaging (MRI) were performed.

Inclusion criteria:

- Patients with an established diagnosis of ischemic stroke (IS), confirmed (CT or MRI of the brain).
- Confirmed diagnosis of type 2 diabetes mellitus (DM 2) based on clinical and laboratory data (in accordance with WHO criteria).
- Age from 58 to 70 years.
- Post-reanemia period of stroke

Exclusion criteria:

- Patients with hemorrhagic stroke or transient ischemic attack.
- Type 1 diabetes mellitus or other endocrinopathies affecting carbohydrate metabolism.
- The presence of severe cardiovascular, renal, hepatic or respiratory failure in the decompensation stage.
- Acute infectious or inflammatory diseases at the time of inclusion.
- Oncological diseases in the active stage.
- Taking anticoagulants or antiplatelet agents within the last 14 days that can significantly change hemostasis parameters.

All subjects were divided into 2 groups:

Group 1 (main) — patients with type 2 diabetes diagnosed before the development of stroke, complicated by newly developed ischemic stroke — 21 people (8 women, average age 60.7 ± 1.8 years; 13 men, average age 59.2 ± 3.5 years). The duration of type 2 diabetes in patients in the main group ranged

from 5 to 15 years. All patients received planned hypoglycemic therapy before the development of ischemic stroke; 44.4% (9 people) — sulfonylurea drugs and metformin; 12 people (55.6%) — insulin therapy. The adequacy of type 2 diabetes treatment was assessed using target glycemic and HbA1c values.

Group II (comparisons) — patients with newly developed ischemic stroke, not suffering from type 2 diabetes, whose main vascular risk factors were arterial hypertension, cerebral atherosclerosis — 19 people (including 7 women, average age 64.2 ± 2.1 years; 12 men, average age 61.8 ± 3.7 years).

Verification of the ischemic nature of stroke was carried out by computed tomography of the brain using a Siemens Emotion 16 multispiral computed tomograph.

All patients with ischemic stroke received basic therapy according to current medical and economic standards, including acetylsalicylic acid, antihypertensive drugs, neuroprotective therapy (cytoflavin, glycine, ceraxon, mexidol).

Study results. We analyzed subjective and objective clinical signs and laboratory data, including macrorheology (platelet and endothelial hemostasis markers) and microrheology (number of fragmented erythrocytes) parameters, as well as lipid fraction assessment in patients with ischemic stroke and type 2 diabetes and comparison with a group of patients with ischemic stroke without type 2 diabetes. Chronic hyperglycemia plays a significant role in the development and progression of vascular lesions in patients with diabetes. Thus, the average glycemic values were 10.9 ± 0.8 mmol/l. Adequacy of glycemic control is directly related to the likelihood of developing stroke. In the UKPDS study, a 1% decrease in HbA1C reduced the risk of stroke by 12%. Transient hyperglycemia in stroke can be caused by a stress response, while persistent hyperglycemia indicates the presence of type 2 diabetes. In most of the patients with stroke we examined, the HbA1C level was $\geq 9.36\%$. This indicated that in a significant proportion of patients, hyperglycemia preceded the development of stroke. Hyperglycemia, which can be retrospectively assessed by the HbA1C level, contributes to a more significant increase in glucose in the acute period of stroke and affects the restoration of impaired neurological functions, as evidenced by the direct relationship between the severity of neurological deficit and the degree of increase in HbA1C. During the analysis of laboratory data, high levels of total cholesterol were found (5.3 ± 0.4 mmol / l). A direct correlation was found between the duration of type 2 diabetes and the severity of dyslipidemia, which contributed to the further progression of cerebral vascular atherosclerosis. The interaction of glucose with lipids and proteins, including structural components of biological fluids, leads to the formation of advanced glycation end products (AGEs), which increase the synthesis of cytokines and growth factors, activate proliferation and sclerosis processes, increase platelet aggregation and thrombus

formation, and cause epigenetic changes. The underlying pathogenesis of stroke, endothelial dysfunction and atherosclerosis, are initiated by hyperglycemia and insulin resistance. At the start of the study, an analysis of subjective and objective clinical data of the two study groups (main and comparison) showed that focal neurological symptoms prevailed in all patients. Clinical manifestations of focal neurological symptoms in individuals of the first group were varied: decreased strength or awkwardness of one half of the body, sensory disorders in the form of hemihyperesthesia, speech disorders in the form of aphotic disorders and dysarthria, cranial innervation deficiency in the form of hemiparesis of the facial muscles, tongue deviation. The frequency of clinical neurological disorders is presented in Table 1.

Table 1.
Clinical symptoms of the patients studied.

Clinical indicators	I(main group) (p=8)		2 (comparison group) (p=19)	
	abs.	\ %	abs.	%
Motor disorders in the form of hemiparesis, monoparesis	21	93,8		86,5
Speech disorders	18	56,8	19	53
Aphotic disorders (impaired understanding or reproduction of oral speech), dysarthria (impaired articulation)	15	18,5	10	9,2
Sensory disorders,	15	83,9	8	73 ,2
Somatosensory, visual	3	9,9	3	5,8
Damage to cranial nerves	14	64,2	7	51,2

General cerebral disorders in the main group were mild in most cases. The assessment of the state of consciousness of patients using the Glasgow Coma Scale (GCS) is given in Table 2.

Table 2.
Assessment of the state of consciousness in points on admission (GCS)

I group (main) n-21		II group (comparisons) n-19	
Points	Number (persons)	Points	Number (persons)
15	7 <8,6%)	15	2(15,4%)
14	5 (30,9%)	14	7(32,7%)
13	2 (27,2%)	13	3(25%)
12	1(14,8%)	12	1(19,2%)
11	1 (7,4%)	11	0

10	3 (8,6%)	10	4 (7,7%)
9	2 (2,5%)		2

Conclusions. Thus, patients with ischemic stroke that developed against the background of diabetes mellitus type 2 have more pronounced neurological disorders and a lower rate of their regression and restoration of lost functions, as well as long-term (up to 6 months) memory impairment, visual-spatial functions and orientation compared to patients with ischemic stroke who do not suffer from type 2 diabetes mellitus. The presence of type 2 diabetes mellitus negatively affects the parameters of micro and macrorheology of the blood and contributes to the progression of the thrombogenic situation in patients with ischemic strokes.

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铝生产过程中全氟碳的形成（热力学分析）

FORMATION OF PERFLUOROCARBONS DURING THE PRODUCTION OF ALUMINUM (THERMODYNAMIC ANALYSIS)**Mikhalev Yuri Glebovich***Doctor of Chemical Sciences, Full Professor
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摘要。考虑到正常工艺过程中碳氧化物 CO_2 和 CO 以及全氟化碳 CF_4 和 C_2F_6 的联合生成，计算了铝生产过程中阳极反应吉布斯能的变化以及阳极相对于铝的电极电位。结果表明，即使在阳极平衡电位 ($\approx 1.2 \text{ V}$) 附近，电解过程中全氟化碳和碳氧化物的生成在热力学上也是可能的，当工业阳极电流密度下的反电动势达到 $\approx 1.8 \text{ V}$ 时，这种可能性更大。然而，根据对正常电解过程中工业电解槽的测量结果，估计废气中全氟化碳的浓度平均为 0.02% 。热力学分析结果与测量结果之间的差异可以用 CF_4 和 C_2F_6 直接与水蒸气发生反应或在气体从阳极底部到采样点的路径上有氧气参与的反应来解释。关键词：铝、电解槽、废气、全氟化碳、热力学分析、吉布斯能、电极电位。

Abstract. *The change in the Gibbs energy of the reaction occurring during aluminum production at the anode and taking into account the joint formation of carbon oxides CO_2 and CO and perfluorocarbons CF_4 and C_2F_6 during the normal technological process, and the electrode potential of the anode relative to aluminum are calculated. It is shown that the formation of perfluorocarbons together with carbon oxides during electrolysis is thermodynamically possible even near the equilibrium potential of the anode ($\approx 1.2 \text{ V}$) and even more so when the back EMF at industrial anode current densities reaches $\approx 1.8 \text{ V}$. However, according to measurements on industrial electrolyzers during normal electrolysis, the concentration of perfluorocarbons in the exhaust gases is estimated at an average of 0.02% . The discrepancy between the results of thermodynamic analysis and measurements is explained by the reactions of CF_4 and C_2F_6 with water vapor directly or with the participation of oxygen on the path of gases from the anode base to the sampling point. Key words: aluminum, electrolyzer, exhaust gases, perfluorocarbons, thermodynamic analysis, Gibbs energy, electrode potential.*

Introduction

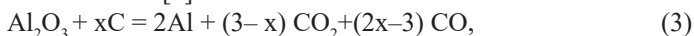
The gaseous products released during the production of aluminum at the anode consist mainly of CO₂ and CO. The reactions of their formation can be represented as [1], [2]:



The ratio between the amounts of CO₂ and CO varies depending on the process parameters of electrolysis. According to the data given in [3], in the absence of anode effects during “normal” electrolysis, the percentage ratio of CO₂/CO can vary from 5.9 to 1.

With the anode effect, when the voltage on the electrolyzer increases to 20–50 V [4], the ratio changes and becomes $\approx 1/3$ [4].

Since these gases are released simultaneously, the overall reaction of their formation is presented in the form [1]:



where x denotes the variable number of moles of carbon participating in the reaction and is related to the mole fraction of carbon monoxide N_{CO} in the mixture of CO₂ and CO: $x = 3/(2-N_{CO})$.

In addition to CO₂ and CO, but in significantly smaller quantities, sulfur-containing gases [2], [5] were found in anode products during studies both in laboratory conditions and in industrial electrolyzers: COS, SO₂, S₂, CS₂, H₂S.

The total content of these gases is 30-50 times less than the content of CO₂ and CO in the exhaust gases.

In addition to sulfur-containing gases, the emissions of aluminum electrolyzers contain H₂O vapor in an amount comparable to the emissions of CO₂, CH₄, the content of which is approximately $2 \cdot 10^{-4}$ of the CO₂ content [6], as well as HF, formed as a result of reactions of aluminum fluoride dissolved in the melt and electrolyte vapor (Na₄AlF₆) in the gas phase with water vapor. Particular attention should be paid to the content of perfluorocarbons in anode gases, which are similar in composition to hydrocarbons and are compounds of carbon with fluorine, the general formula of which can be represented as (C_nF_{2n+2}), where $n = 1, 2, 3$, etc.

The aluminum industry is the main source of perfluorocarbons (PFCs) entering the atmosphere. The duration of stay of these gases in the atmosphere is estimated at 10,000 - 50,000 years [7], and their global warming potential is 6500-12200 times greater than that of CO₂ [6].

It is currently believed that perfluorocarbons are emitted during aluminum production almost continuously [8]. According to the accepted terminology, if they are emitted at a voltage on the electrolyzer U less than 8 V, i.e. during “normal” electrolysis, a low-voltage anode effect occurs; if the release occurs at $U > 8$ V, a high-voltage anode effect occurs.

The largest amount of perfluorocarbons is accounted for by two gases CF_4 and C_2F_6 , while the concentration of C_2F_6 is approximately an order of magnitude less than the concentration of CF_4 [6], [9], [10].

In percentage terms, the largest amount of perfluorocarbons is formed at the anode and released from the electrolyzer during high-voltage anode effects. In this case, the gas phase has an average composition of 60–70% CO , 10–15% CO_2 , 15–20% CF_4 , and 0.5–1.0% C_2F_6 [11]. The greater the frequency and duration of the anode effects, the more perfluorocarbons are released.

If the alumina concentration at the anode becomes less than 1.5% [12], part of its surface is blocked by a gas film [1], as a result, the current density reaches a value at which the anode potential shifts strongly to the positive side and exceeds the potential E_0 (relative to the aluminum reference electrode), necessary for the formation of perfluorocarbons, for example at 960 °C, according to the reactions:



and the joint formation of CO_2 , CO , CF_4 and C_2F_6 occurs at the anode.

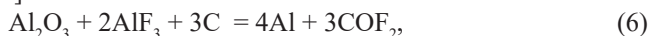
With “normal” electrolysis, the amount of perfluorocarbons in the exhaust gases is significantly less [9]. Indeed, an analysis of the experimental data presented in [8], [9], [13] shows that the total content of CF_4 and C_2F_6 in the exhaust gases varies greatly not only at different enterprises, but also in different electrolyzers and varies from $2 \cdot 10^{-4}\%$ до 0,22 % (average value for all data $\approx 0,02\%$).

The appearance of perfluorocarbons in this case is associated mainly with the following factors [2], [8]:

1. Interference with the operation of the electrolyzer: replacement of anodes, extraction of metal, feeding the electrolyzer with alumina at the end of the under-feeding period.

2. Reduction in the current passing through an individual or several individual anodes.

3. Formation of carbonyl fluoride COF_2 on the anode [2], for example, according to the reaction [14]



as a result of which the standard change in Gibbs energy ΔG° at a temperature of 960 °C is 1950.41 kJ. It follows that according to the equation

$$E^\circ = -\frac{\Delta G^\circ}{zF} \quad (7)$$

for reaction (6) to occur, it is necessary that the electrode potential of the anode E_0 relative to aluminum exceeds 1.684 V. In equation (7), z is the number of electrons participating in the reaction ($z = 12$), F is the Faraday number, 96487 C/mol equivalent.

Since the magnitude of the anodic overvoltage at industrial anodic current densities is 300 – 860 mV [1], [15], the value of 1.684 V may well be exceeded and, therefore, the probability of COF_2 formation is quite high.

The resulting carbonyl fluoride is unstable and reacts with the carbon of the anode to form CF_4 [16] and C_2F_6 according to the reactions



where the change in Gibbs energy as a result of reactions is calculated for a temperature of 960 oC.

Thus, perfluorocarbons appear in the exhaust gases of the electrolyzer. Since the change in Gibbs energy of reaction (8) is negative, and reaction (9) is positive, the occurrence of reaction (8) is thermodynamically more probable.

In addition, perfluorocarbons are released during the start-up of electrolyzers [17], especially when only electrolyte is poured in. In this case, due to the rise of the anode array, the distance between the anode and cathode is greater than during normal electrolysis, and the voltage in the electrolysis can exceed 8 V.

It has also been suggested [6] that the formation of perfluorocarbons can occur continuously or periodically on a separate anode, without spreading to neighboring anodes, when, apparently, the concentration of alumina at its surface is less than 1.5%.

Despite the significantly lower content of perfluorocarbons in the exhaust gases during normal electrolysis compared to their amount during anode effects, the share of CF_4 and C_2F_6 released over a certain (fairly long) period of time or calculated per unit mass of aluminum obtained during normal electrolysis is estimated to be from 0.19 to 0.93 of the total release of perfluorocarbons [10], [13], [18].

Thus, the amount of perfluorocarbons released without the occurrence of anode effects is quite large.

The purpose of this work is a thermodynamic analysis of the complete anodic reaction to determine the possibility of the joint formation of carbon oxides and perfluorocarbons during normal electrolysis without taking into account high-voltage anode effects and various interventions in the operation of electrolyzers.

Thermodynamic analysis

Neglecting the release of gases containing sulfur and not considering the formation of HF, we analyze the thermodynamic possibility of the joint formation during electrolysis of only four gases CO_2 , CO, CF_4 , C_2F_6 . For this, we use equation (3) and equation



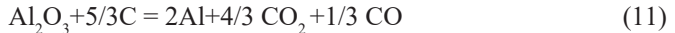
Let n moles of alumina react according to reaction (3) with m moles of aluminum fluoride according to reaction (10). We will restrict ourselves to the case

when in a mixture of CO_2 and CO $N_{\text{CO}} = 0.2$, which, according to Beck's equations [19]:

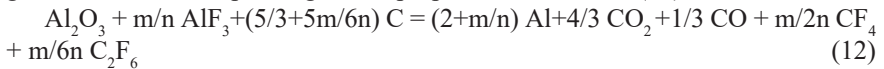
a) for electrolyzers with baked anodes $N_{\text{CO}} = (2 \cdot 105 - 200 \cdot \eta_T - 8)/105$;

b) for Soderberg electrolyzers $N_{\text{CO}} = (2 \cdot 119 - 200 \cdot \eta_T - 8)/119$ corresponds to a current efficiency of approximately 90% for electrolyzers with baked anodes. In Beck's equations, η_T is the current efficiency in fractions.

When $N_{\text{CO}} = 0.2$ in the equation (3) $x = 5/3$ and it takes the form



By adding equations (10) and (11) taking into account the coefficients n and m , and dividing the left and right parts of the total expression by n , we obtain a general equation for analysis that takes into account the joint formation of all four gases at the anode depending on the proportion of reaction (10).



The number of moles of reagents and the thermodynamic characteristics of reaction (12) depend on the parameter m/n , which can formally vary from zero to significant values, i.e., within wide limits. For the analysis, we will limit ourselves to the case of 0.01 – 10. The standard change in the Gibbs energy as a result of reaction (22), the change in the Gibbs energy ΔG taking into account the activities of alumina and aluminum fluoride and the partial pressures of gases, as well as the concentrations and rate of formation of the components of the analyzed gas phase in the total mixture in reaction (12) depending on the parameter m/n for a temperature of 960 °C are given in Table 1.

Table 1.

Thermodynamic characteristics of reaction (22) and the relative amounts of gases formed at the anode depending on the parameter m/n

m/n	ΔG° , kJ	ΔG , kJ	Concentrations and formation rates of components of the analyzed gas phase, wt.%, (kg/tAl)			
			CO_2	CO	CF_4	C_2F_6
0,01	688,8	697,1	85,4 (1082)	13,6 (172)	0,6 (8)	0,4 (4)
0,025	698,6	707,3	84,2 (1074)	13,4 (171)	1,6 (20)	0,8 (10)
0,05	715,0	724,5	82,2 (1061)	13,1 (169)	3,1 (40)	1,6 (21)
0,1	747,4	758,7	78,5 (1035)	12,5 (165)	5,9 (78)	3,1 (40)
0,25	845,1	862,6	69,2 (966)	11,0 (154)	13,0 (181)	6,8 (95)
0,5	1008,0	1037,2	57,8 (870)	9,2 (139)	21,7 (326)	11,3 (170)
0,75	1170,7	1212,3	49,6 (791)	7,9 (126)	27,9 (445)	14,6 (232)
1	1333,4	1387,9	43,5 (725)	6,9 (116)	32,6 (544)	17,0 (284)
2	1984,6	2092,9	29,0 (544)	4,6 (87)	43,6 (815)	22,8 (426)
4	3286,7	3507,8	17,5 (362)	2,8 (58)	52,4 (1087)	27,3 (568)

6	4588,9	4925,8	12,5 (272)	2,0 (43)	56,2 (1223)	29,3 (639)
8	5891,2	6345,2	9,7 (217)	1,5 (35)	58,3 (1305)	30,5 (682)
10	7193,2	7765,2	8,0 (181)	1,3 (29)	59,6 (1359)	31,1 710)

The value of ΔG_0 was calculated using the HSC Chemistry 9 program. The value of ΔG is obviously equal to

$$\Delta G = \Delta G^0 + RT \ln \frac{p_{CO_2}^{4/3} \cdot p_{CO}^{4/3} \cdot p_{CF_4}^{m/2n} \cdot p_{C_2F_6}^{m/6n}}{a_{Al_2O_3}^{m/n} \cdot a_{AlF_3}}, \quad (13)$$

where R – universal gas constant; T is the absolute temperature; p_i is the partial pressure of the corresponding gas; a_i is the activity of alumina or aluminum fluoride in the electrolyte.

The partial pressures of gases in a mixture are equal to the mole fractions if we assume that the gases behave as ideal gases and Dalton's law is fulfilled [20], $p_i = P_{\text{общ}} \cdot y_i$, where $P_{\text{общ}}$ – the total pressure of the gas phase at the anode, consisting of only four gases, equal to 1 atm; y_i is the mole fraction of each of the gases. The activities of alumina and aluminum fluoride depend on the composition of the melt; for certainty, they are calculated for the following composition, % mass: AlF_3 – 10; CaF_2 – 4; Al_2O_3 – 3; the rest is cryolite. The cryolite ratio (CR) is 2.3.

The activity of alumina is estimated using the equation [19]

$$a_{Al_2O_3} = 0,03791 \cdot ROS + 2,364 \cdot ROS^2 - 2,194 \cdot ROS^3 + 0,8686 \cdot ROS^4, \quad (14)$$

where ROS – the ratio of the current alumina concentration to the alumina concentration at saturation at a given temperature and melt composition.

For a given electrolyte composition and temperature 960 °C $a_{Al_2O_3} \approx 0,197$.

Активность фторида алюминия была оценена по уравнению [21]

$$a_{AlF_3} = \exp(1,9656 - 4,7234 \cdot CR + 0,51281 \cdot KO^2) \cdot (1 - x_{CaF_2} - x_{MgF_2}) \cdot (1 - 0,375a_{Al_2O_3}) \quad (15)$$

and amounted to 0.00185. In equation (15) x_{CaF_2} and x_{MgF_2} – respectively, the molar fractions of calcium and magnesium fluorides in the melt.

Based on the ΔG values, the difference in electrode potentials of the anode and aluminum E was calculated for different m/n values using the equation

$$E = - \frac{\Delta G}{zF} \quad (16)$$

where z – the number of electrons participating in reaction (12) and depending on the parameter m/n; F is the Faraday number.

The dependence of the absolute value of E on m/n is shown in Fig. 1.

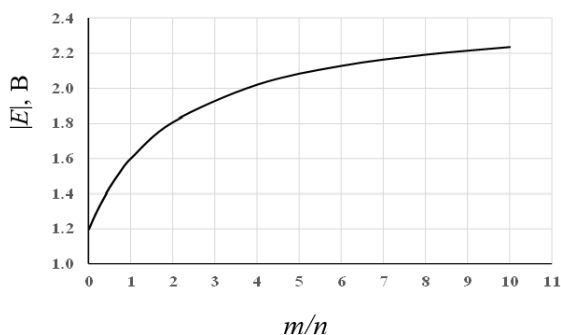


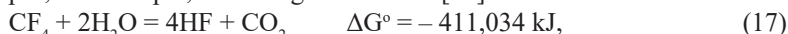
Figure 1. Dependence of the electrode potential of the anode relative to aluminum on the parameter m/n

Knowing the difference between the electrode potentials of the anode and aluminum under real electrolysis conditions, it is possible, using the graph in Fig. 1, to determine the ratio m/n and, using Table 1, to find the molar fractions of gases whose formation at the anode can be expected from the point of view of thermodynamics under these conditions. The greater the difference between the electrode potentials of the anode and aluminum under current (back EMF (counter electromotive force)) [19], the greater the amount of perfluorocarbons that can form at the anode.

The formation of an insignificant, but non-zero amount of perfluorocarbons can be expected already at E corresponding to the EMF, close to the equilibrium, which is estimated at ≈ 1.2 V [1], [19].

During electrolysis in laboratory and industrial conditions, the back EMF can reach values of ≈ 1.8 V [19], [22], [23]. In this case, according to Fig. 1, $m/n \approx 2$, which means that the gas phase at the anode can contain 43.6 wt.% CF_4 and 22.8 wt.% C_2F_6 , which exceeds the concentrations of CF_4 and C_2F_6 in the exhaust gases of electrolyzers even with anode effects [2], [11], [24], [25], [26]. During “normal” electrolysis, i.e., in the absence of high-voltage anode effects, the content of perfluorocarbons in the exhaust gases, as already noted, is even less.

The discrepancy in the results of thermodynamic analysis and measurements on electrolyzers is apparently due to the fact that CF_4 and C_2F_6 can interact with water vapor, for example, according to reactions [27]



where the change in Gibbs energy as a result of reactions is calculated for a temperature of 960 °C.

The reactions occur in the bubble layer at the anode and on the path of gases from the anode base to the sampling site with the participation of oxygen oxidized at the anode and water vapor, which can form at the anode due to the interaction of oxygen with residual hydrogen in the anode material, or with the participation of water vapor and atmospheric oxygen [2].

At high temperatures, little different from the electrolysis temperature, the rate of reactions between gases can be very high, as a result of which the content of perfluorocarbons in the gas phase is significantly reduced.

Conclusion

Based on the results of thermodynamic analysis, it can be assumed that during “normal” electrolysis, in addition to CO_2 and CO , perfluorocarbons CF_4 , C_2F_6 can form at the anode, the amount of which, released from the electrolyzers and detected in samples taken from the exhaust gases, is insignificant due to the reactions of CF_4 and C_2F_6 with water vapor directly or with the participation of oxygen and depends on the rate of these reactions.

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关于墙体材料吸收蒸汽水分的能力
**ON THE ABILITY OF WALL MATERIALS TO ABSORB
VAPOROUS MOISTURE**

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摘要：简要阐述了建筑行业对节能材料的需求。分析了多层建筑墙体性能下降的原因，并论证了扩大分散增强泡沫混凝土产品实际应用的必要性。试验研究结果表明，由于泡沫混凝土中分散的合成纤维增强材料，其吸收水汽的能力显著下降。

关键词：多层墙体，吸湿性，泡沫混凝土。

Abstract. *The need of the construction industry for energy-saving materials is briefly substantiated. The results of the analysis of the reasons why multilayer building walls tend to deteriorate their performance properties are presented. The need to expand the practical application of products made of dispersed reinforced foam concrete is substantiated. The results of experimental studies are presented, reflecting a significant decrease in the ability of foam concrete to sorb vaporous moisture as a result of their dispersed reinforcement with synthetic fibers.*

Keywords: *multilayer walls, sorption moisture, foam concrete.*

Introduction

The limited natural resources of the planet and the dependence of the sustainability of society on the level of development of human engineering activities require a scientifically based approach to the problem of energy saving. Given the volume of energy consumption by the housing and communal services, it is necessary to strive to reduce the energy intensity of the construction complex. Energy standards in many countries are aimed at improving the energy efficiency of build-

ings under construction and reconstruction since the second half of the twentieth century and are revised towards tightening every 5 years [1]. The construction industry must take into account that the values of reduced heat-transfer resistance of enclosing structures have increased dramatically. That is why, at the end of the 20th century, technologies have become popular that propose making building walls multilayered and using materials that are either short-lived (mineral wool slabs, etc.) or environmentally aggressive and fire-hazardous polymers (expanded polystyrene, etc.) [2-4].

In order to ensure compliance with regulations, the Russian Federation adopted the experience of Europe in the construction of multilayer walls. The problems of insulating the facades of previously constructed buildings were solved by using expanded polystyrene, industrial thermal insulation made of mineral wool slabs or masonry made of autoclaved aerated concrete of grades D 500 and below [2-5].

Statement of the problem

The practice of operating buildings with multilayer walls has shown [2-5] that the problems that arise during their operation are more resource-intensive than the technical and economic effect obtained as a result of increasing the heat-transfer resistance of the walls. 30 years of experience in the operation of multilayer walls has revealed a list of problems that systematically arise in multilayer structures;

- the estimated heat transfer resistance established at the design stage is not maintained under the operating conditions of the facility with any of the previously listed types of thermal insulation inclusions [4, 5];
- the sanitary and hygienic conditions of rooms with a multilayer external wall are characterized by the appearance of mold after several years of operation [5-8];
- the durability of the inter-repair operation of multilayer enclosing structures is inferior to single-layer ones [4, 5].

The listed problems fully or partially depend on the ability of the materials placed in the volume of multilayer walls to pass steam through themselves and accumulate it in the thickness of the structure. This is important because the formation of condensate in the autumn-winter period and its incomplete evaporation in the summer creates in the volume of highly porous wall layers:

- cold bridges (thermal conductivity of air $0.023 \text{ W/m}\cdot\text{0C}$, water $0.56 \text{ W/m}\cdot\text{0C}$) and the thermal properties of the structure deteriorate in correlation with the thermal conductivity of the accumulated water and the period of operation;
- moisture and oxygen in an environment with a positive temperature create favorable conditions for the development of mold indoors and, thus, sharply worsen the sanitary and hygienic living conditions of people.

In addition, modern materials of multilayer structures have different periods of operational reliability. Repair of the inner layers will be necessary as a result of the loss of heat transfer resistance, which will require significant material costs.

Of all the types of wall materials used for the construction of enclosing structures of buildings from the point of view of safety, environmental friendliness to humans, material and energy intensity of manufacture, cellular concrete has been considered the most effective for more than 100 years. The increase in requirements for heat transfer resistance has excluded the possibility of practical use of single-layer large-sized wall structures made of autoclaved aerated concrete grade D600 [9] because the tensile strength does not ensure their defect-free stripping and transportation.

The transition to small-piece products of grades D500 and below showed that the structural features of gas porosity and interpore partitions in autoclaved aerated concrete [10, 11] become significant for their ability to absorb and retain vaporous moisture. It was established [11] that the growth of sorption moisture accumulation in autoclaved aerated concrete grade D500 when moving from the parameters of the ambient humidity from category “A” to “B” exceeds 10 times. Consequently, for the effective construction of walls in modern construction practice, it is necessary that the pores in cellular concretes be predominantly closed, and the interpore partitions have insignificant sorption moisture. Results

The results of the authors’ earlier assessment of the differential water-retaining properties of foam concrete showed that dispersed reinforcement is capable of reducing the specific surface area of their interpore partitions in equally dense materials by 13...15%, and the amount of microcapillary moisture accumulation by up to 25% by weight. Therefore, in the course of these studies, foam concrete mixtures of various density grades were manufactured with a cement:filler ratio of 1:1. Polypropylene fiber (PP) manufactured by Si-Airide LLC with a diameter of 18 μm and a length of 18 mm was used as dispersed reinforcement.

The concrete mixtures were manufactured in one stage, molded in cube samples with a 100 mm edge and hardened under normal conditions for 28 days. Cubes with a 50 mm edge were cut out of the middle of the samples, intended for testing for sorption moisture. All samples were first dried to a constant weight, then placed in desiccators (photo) and tested according to GOST 12852.6 - 2020 “Cellular concrete. Method for determining sorption moisture» on 3 twin samples.

The previously experimentally established increase in the density of interpore partitions (decrease in specific surface area) in foam concretes due to dispersed reinforcement with synthetic fibers should lead to a decrease in their sorption moisture. To experimentally test the hypothesis, foam (PB) and fiber-reinforced foam concretes (FPB) of various density grades were manufactured. Fiber-reinforced foam concretes were dispersedly reinforced with polypropylene fiber in an amount of 0.5 and 1.0% of the filler weight (table).

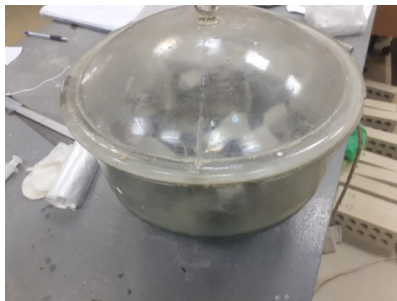


Figure 1. photo of foam concrete tests for sorption moisture

Preparation of the test environment was as follows. In accordance with the requirements of GOST 24816 – 2014 “Construction materials. Method for determining equilibrium sorption moisture”, 2 sulfuric acid solutions were prepared. A solution with a concentration of 36.88% and a density of 1.276 g/l provided a relative humidity of 60% in the desiccator. A solution with a concentration of 5.93% and a density of 1.038 g/l provided a relative humidity of 97% in the desiccator. The results of the experimental studies of sorption moisture are presented in the table.

Foam concrete brand	Average density of foam concrete in dry condition, kg/m ³	Fiber content (% of filler weight)	Sorption moisture (vol.%) at relative air humidity		The coefficient of saturation of pores with moisture as a result of sorption of water vapor
			60% (A)	97% (B)	
D400	408	None	4,827	8,262	0,097
D600	613	None	5,633	9,044	0,118
D800	821	None	6,709	9,715	0,141
D400	393	0,5 III	3,628	5,424	0,063
D600	605	0,5 III	4,855	7,419	0,097
D800	797	0,5 III	4,973	7,944	0,115
D400	398	1,0 III	3,196	4,625	0,046
D600	601	1,0 III	4,069	6,293	0,082
D800	792	1,0 III	4,314	7,111	0,103

The analysis of the data presented in the table shows that the dispersed reinforcement of foam concrete mixtures with polypropylene fibers leads to an insignificant decrease in their actual average density. As for the level of sorption moisture indicators, it is important to note that they depend on:

- the brand of foam concrete by density;
- the relative humidity of the test environment;
- fiber consumption.

In heat-insulating foam concrete (D400) that did not contain dispersed reinforcement, the difference in sorption moisture accumulation between conditions “A” and “B” exceeded 71%; in structural and heat-insulating (D600) - 60%; in structural (D800) - almost 45%. The obtained results are logical because the higher the density of gas-filled concrete, the better its inter-pore partitions resist the penetration of vaporous moisture. With dispersed reinforcement in the amount of 0.5% of the filler weight, the sorption moisture of equal-density foam concretes under air-dry operating conditions (A) decreases by 33%, 16% and 35%, respectively. With a higher saturation with fiber (1% by weight), the values of equilibrium sorption moisture decrease additionally. For assessing the efficiency of using dispersedly reinforced foam concretes in wall structures of buildings, the results obtained in assessing the parameters of their sorption moisture in environment “B” are much more important. Foam concretes without fiber were filled with sorption moisture from 9.7% to 14.1% of the pore volume present in the materials (table). Foam concretes containing 0.5% fiber did not accumulate more than 6.3%...11.5%. The increased fiber content allowed to reduce the sorption moisture accumulation to 4.6...1.0%, i.e. 1.5...2.0 times compared to equal-density foam concretes without fiber.

Conclusion

Practice has shown that widespread thermal insulation materials (mineral wool slabs or foam polymers) and traditional types of cellular concrete do not fully meet the requirements of thermal efficiency in multilayer walls. The ability of the listed materials to accumulate sorption moisture under operating conditions significantly worsens the technical, economic and sanitary-hygienic properties of buildings. The single-stage technology of dispersed reinforced foam concrete creates the prerequisites for obtaining wall materials whose sorption properties are several times better than those traditionally used, meets modern energy saving requirements and can be suitable for the construction of single-layer walls.

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麦薹马(HAPLOTHRIPS TRITICI)对春软小麦籽粒生产力结构指标的影响
**THE INFLUENCE OF WHEAT THRIPS (*HAPLOTHRIPS TRITICI*)
ON THE INDICATORS OF THE GRAIN PRODUCTIVITY
STRUCTURE OF SPRING SOFT WHEAT**

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注释。本研究旨在确定受薹马侵害和未受薹马侵害的春小麦穗的生产力结构指标的变化。研究目的是分析受薹马侵害和未受薹马侵害的春软小麦生产力结构指标之间的差异。该研究于 2022–2024 年在伏尔加河畔康斯坦丁诺夫育种与种子生产研究所的种子作物上进行。分析对象为 Kinelskaya 59、Kinelskaya yubileynaya 和 Kinelskaya otrada 品种的冬小麦籽粒。本文介绍了小麦薹马对春软小麦生产力指标（如茎长、穗长、每穗粒数、每穗粒重、千粒重）影响的分析结果。在对软冬小麦试掘进行植株分析时，根据品种测试推荐的方法确定了产量结构要素。与未受害小麦相比，受害小麦生产茎秆长度缩短38.8–41.6%，穗长缩短14.0–31.4%。受害穗粒数减少47.8–60.0%，千粒重减少27.9–46.6%，穗粒重减少62.9–67.7%。多年研究显示，小麦薹马造成的作物损失高达4.4–9.7%。Kinelskaya Otrada品种受该害虫危害程度最高，但该品种对该害虫的抗性最弱。

关键词：危害、穗、茎秆、小麦薹马、产量。

Annotation. The purpose of the research is to establish changes in the indicators of the productivity structure of spring wheat from damaged and undamaged ears of wheat thrips. The research objectives were to analyze the differences in the indicators determining the structure of productivity of spring soft wheat from damaged and undamaged wheat thrips ears. The research was conducted in 2022–2024 on seed crops of the P. N. Konstantinov Volga Research Institute of Breeding and Seed Production. Winter wheat grains of Kinelskaya 59, Kinelskaya yubileynaya, and Kinelskaya otrada varieties were used for analysis. This paper presents the results of an analysis of the effect of wheat thrips on such productivity indicators of spring soft wheat as stem length, ear length, number of grains per ear, weight of grains per ear, weight of 1000 seeds). The determination of the elements of the yield structure during the plant analysis of trial sheaves of soft winter wheat was

carried out according to the methods recommended for variety testing. The length of productive stems damaged by wheat thrips decreased by 38.8–41.6%, and the length of the damaged ear by 14.0–31.4%, compared with the undamaged ones. The number of grains in the damaged ear decreased by 47.8–60.0%, the mass of 1000 grains – by 27.9–46.6%, the mass of grains in the ear by 62.9–67.7%. Crop losses from wheat thrips in the years of research amounted to 4.4–9.7%. The highest rates of grain damage by this pest were noted in the Kinelskaya Otrada variety, which turned out to be the least resistant to this pest.

Keywords: damage, ears, stems, wheat thrips, yield.

Introduction

Spring wheat is one of the most important agricultural crops, which is of great importance for ensuring food security both in Russia and around the world. Among the variety of grains, it stands out for its high value and wide distribution. However, the yield of spring wheat is negatively affected by many abiotic and biotic factors. In particular, harmful insects can cause significant damage to crops [4].

Wheat thrips is a widespread and dangerous pest of grain crops. These small insects belonging to the order Thysanoptera are capable of causing significant damage to crops, reducing their quality and quantity. The study of its harmfulness is crucial for the effective protection of crops and ensuring food security. Adults harm the leaves by localizing in the area of the leaf sheaths, which leads to discolored silvery areas, wilting of the leaves and damage to the ears. This leads to their deformation, delayed development and the appearance of whiteness [1; 2].

Damage to flowers, ovaries, and young grains by both adult thrips and their larvae causes hollowness, the formation of defective grain, and a decrease in its weight. The economic damage caused by wheat thrips can be very significant. During the years of mass reproduction of the pest, crop losses can reach a significant percentage, which leads to lower incomes of agricultural enterprises and higher grain prices [3].

The purpose of the research is to establish changes in the indicators of the productivity structure of spring wheat from damaged and undamaged ears of wheat thrips.

The research objectives are to analyze the differences in indicators that determine the structure of productivity of spring soft wheat from damaged and undamaged wheat thrips ears.

Materials and methods

Field studies were conducted in the forest-steppe of the Samara region on varieties of soft spring wheat Kinelskaya 59, Kinelskaya yubileynaya, Kinelskaya otrada, created in the laboratory of breeding and seed production of spring wheat of the Volga Research Institute of Breeding and Seed Production named after P.

N. Konstantinov. A sheaf of spring wheat from the 2022–2024 harvest was used for the analysis. The sheaf was selected diagonally across the field in 10 locations from an area of 1 m². The ears were cut in the phase of full grain maturity, from each field in 3 repetitions. In the laboratory, sheaves were analyzed for the presence of wheat thrips, and a comparative analysis of the productivity of ears from damaged and undamaged stems was performed.

Results and their discussion

As you know, wheat thrips is a specialized phytophagous plant, the life cycle of which is closely related mainly to wheat. Causing irreparable damage to the vegetative and generative organs of plants. In the period from 2022 to 2024, studies were carried out aimed at studying the structural analysis of spring soft wheat undamaged and damaged by wheat thrips (Table 1).

As a result of exposure to wheat thrips, the size of productive stems decreased by 38.8–41.6 %. The damaged ears, in turn, became shorter by 14–31.4 % compared to healthy plants. The greatest decrease in these indicators was observed in Kinelskaya otrada and Kinelskaya 59 varieties. Thrips larvae feed on the forming and maturing grain, especially actively at the stages of milk and milk-wax ripeness. They accumulate in the grooves of the grains, absorbing nutrients, which leads to a decrease in grain weight.

The number of grains in the damaged ears decreased by an average of 47.8–60.0 % compared to the undamaged ones. The effect of wheat thrips on the weight of 1000 grains in an ear directly depends on the nutritional activity of this pest. In the ears damaged by wheat thrips, the weight of 1,000 grains decreased by an average of 27.9–46.6 % compared to the undamaged ones. The total grain weight in an ear depends on the number of grains and the mass of 1000 grains. In wheat thrips ears, this weight decreased by an average of 62.9–67.7 % compared with healthy ears. The degree of damage from this pest is calculated based on the proportion between healthy and damaged wheat stalks in the sown fields.

In the studied wheat crops Kinelskaya 59, Kinelskaya yubileynaya and Kinelskaya otrada the number of ears damaged by wheat thrips was 14.2, 16 and 17.1%, respectively, and undamaged 84, 86 and about 83%, with grain yields in intact ears of 4.1–5.0 t/ha, in damaged – 0.2–0.4 t/ha. The results of the statistical analysis ($HCP_{0.05}$) revealed significant differences between all the studied varieties in most of the characteristics characterizing their productivity.

Table 1
The effect of wheat thrips on the productivity structure of spring wheat
(average data, 2022–2024)

Variety		Productive stems	Number of ears		Stem length, cm	Ear length, cm	Number of grains per ear	The mass of grains in an ear, g	Weight of 1000 seeds, g	Yield, t/ha
			instance /m ²	%						
Average by variety	Kinelskaya 59	Healthy controls	310	84,0	88,0	10,0	41,0	1,50	45,0	5,0
		Damaged ones	66,0	16,0	52,3	7,3	18,2	0,53	29,0	0,3
		Deviation, %			-40,5	-27,0	-56,0	-64,6	-35,5	
		HCP _{0,05} Healthy	30,71		14,18	2,69	13,2	0,57	5,50	1,21
		HCP _{0,05} Damaged ones	12,40		9,4	0,77	2,75	0,17	9,3	0,18
	Kinelskaya yubileynaya	Healthy controls	335	86,0	90,5	10,0	37,0	1,62	43,0	4,5
		Damaged ones	60,0	14,2	55,3	8,6	19,3	0,60	31,0	0,2
		Deviation, %			-38,8	-14,0	-47,8	-62,9	-27,9	
		HCP _{0,05} Healthy	27,88		4,0	11,7	8,11	0,60	0,40	0,16
		HCP _{0,05} Damaged ones	25,49		12,2	2,05	4,36	0,25	10,3	0,20
	Kinelskaya otrada	Healthy controls	3340	83,0	86,0	10,2	37,6	1,55	45,0	4,1
		Damaged ones	70,0	17,1	50,2	7,0	15,0	0,50	24,0	0,4
		Deviation, %			-41,6	-31,4	-60,0	-67,7	-46,6	
		HCP _{0,05} Healthy	23,17		7,17	1,34	2,15	0,15	10,2	0,52
		HCP _{0,05} Damaged ones	11,18		8,66	1,82	1,56	0,11	1,32	0,12

Conclusion

Wheat thrips is a dangerous pest of grain crops, particularly for spring wheat, which can cause significant damage to crops. To effectively protect crops, it is necessary to apply an integrated approach, including agrotechnical techniques, the use of resistant varieties, biological control and, if necessary, the use of insecticides.

Damage to productive stems leads to deterioration of the most important indicators affecting the quality and quantity of grain. The number of grains in the damaged ear decreased by 47.8–60.0 %, the mass of 1000 grains by 27.9–46.6 %, the mass of grains in the ear by 62.9–67.7 %. Crop losses from wheat thrips in the years of research amounted to 4.4–9.7 %. The highest rates of grain damage by this pest were noted in the Kinelskaya otrada variety, which turned out to be the least resistant to this pest.

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俄罗斯超深层碳酸盐岩储层性质预测方法

PREDICTION METHODOLOGY FOR PROPERTIES OF ULTRA-DEEP CARBONATE RESERVOIRS IN RUSSIA

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摘要: 本文研究俄罗斯超深地层(超过6.5公里)碳酸盐岩储层物性预测方法。重点阐述了综合分析方法体系,包括沉积环境、成岩后生改造及构造活动过程分析。通过碳酸盐岩变形行为实验模拟数据,揭示了其孔渗参数随深度变化的统计规律。特别以滨里海盆地和西西伯利亚油田的成功应用案例,论证了该方法的有效性。研究表明:整合古地理重建、实验模拟与统计分析方法,可显著提升深部储层物性预测精度,对提高油气勘探效率具有重要实践意义。

关键词: 碳酸盐岩储层, 超深地层, 物性预测, 实验模拟, 滨里海盆地, 西西伯利亚, 蒂曼-伯朝拉油气区, 含油气层系。

Abstract. *The article discusses a methodology for predicting the properties of carbonate reservoirs at ultra-deep depths (more than 6.5 km) in Russia. The main attention is paid to an integrated approach, including the analysis of sedimentogenic conditions, postsedimentary transformations and tectonic processes. The results of experimental modeling of the deformation behavior of carbonate rocks, as well as statistical data on the change in their filtration-capacitive properties with depth are presented. Particular attention is paid to examples of successful application of the methodology in the fields of the Caspian Basin and Western Siberia. It is shown that the integration of paleogeographic, experimental and statistical methods allows to increase the accuracy of forecasting reservoir properties at great depths, which contributes to an increase in the efficiency of exploration work.*

Keywords: *carbonate reservoirs, ultra-deep depths, property forecasting, experimental modeling, Caspian Basin, Western Siberia, Timan-Pechora province, oil and gas complexes.*

Predicting the properties of carbonate reservoirs at very great depths (more than 4.5 km) is one of the most complex problems in modern petroleum geology.

This is due to the need to take into account many interrelated factors, including sedimentary conditions, postsedimentary transformations, tectonic processes and thermobaric conditions. In Russia, forecasting methods are being developed based on studies conducted at the Institute of Geology and Mineralogy and other research centers, using an integrated approach that includes paleogeographic analysis, experimental modeling and statistical data processing. The relevance of this topic is due to the growing interest in deep-seated oil and gas complexes, such as the Caspian Basin, Western Siberia and Timan-Pechora, where carbonate reservoirs play a key role.

1. Main factors in the formation of carbonate reservoirs

1.1 Sedimentary conditions

The primary properties of carbonate reservoirs are formed in specific sedimentation conditions. The most favorable are coastal zones of the open sea with high hydrodynamic activity, where high-capacity rocks are formed, such as shell limestones, oolitic sandstones and biomorphic deposits. Their porosity can reach 7-10%. In remote parts of the shelf and basin facies, low-capacity reservoirs are formed (porosity less than 3%), for example, chemogenic limestones and dolomites.

1.2 Post-sedimentation transformations

Secondary changes in carbonate rocks include:

- Physicochemical processes: dissolution, dolomitization, silicification.
- Physicomechanical processes: compaction, crack formation.

Experimental data show that carbonate rocks, when deformed under conditions of uneven compression, can demonstrate an increase in voids of up to 10-20%, which is significantly higher than that of terrigenous rocks. 2. Forecasting Methodology

2.1 Paleogeographic Analysis

Reconstruction of sedimentation conditions is based on regional paleogeographic maps. For example, for the Caspian Basin, shallow paleoshelf zones are distinguished, where cavernous-porous-fractured reservoirs are predicted.

2.2 Experimental Modeling

Studies of the deformation behavior of rocks at high pressures and temperatures make it possible to estimate changes in porosity and permeability. For example, for the Tengiz dolomites, an increase in voidage of 4-9% was established.

2.3 Statistical Data Processing

Analysis of the dependences of porosity on depth shows that for carbonate rocks of the Caspian region, at a depth of 5 km, porosity reaches 11-12%, and at depths of 6-8 km it stabilizes at a level of 8-10%.

2.4 Forecasting by selecting analog objects.

The forecasting method based on the selection of analog objects is convenient and very effective in the case of considering new wells. Based on the geolog-

ical and seismic exploration data of the developed object, objects with similar geological and physical characteristics (GPC) are selected. It becomes possible to determine the rate of decline based on the accumulated data on the analog object and apply, for example, the method of decline curves to a new object. It is worth emphasizing that the method of selecting analog objects has a key advantage in that, by analyzing the history of development, experts can adopt the best strategy for developing a new one, determining the necessary composition of the GTM. However, due to the large number of GPCs affecting the production process, the selection of an analog object is a labor-intensive task. It is important to take into account that even with similar GPCs, each object has its own unique features affecting the process of development and extraction of hydrocarbons. Therefore, it is necessary to apply an integrated approach that includes not only quantitative parameters, but also qualitative aspects, such as the history of development and adaptation of methods to specific conditions. However, the method also has its drawbacks: selecting an analog object is a labor-intensive task due to the large number of geological and physical characteristics that affect the production process. In addition, even with similar characteristics, each object has its own unique features that affect the process of development and extraction of hydrocarbons.

Automated algorithms are used to select analog objects, which allow you to find and rank the most suitable analogs using mathematical calculations.

3. Examples of the application of the method

The method for predicting the properties of carbonate reservoirs at ultra-deep depths has been successfully applied in various oil and gas regions of Russia. Below are key examples of its use, based on deep and ultra-deep drilling data, as well as geological and geophysical studies.

3.1. Caspian Depression

In the Caspian Depression, especially at the Tengiz and Karachaganak fields, the method made it possible to identify zones of development of fractured-cavernous reservoirs at depths of 6.5–7 km. Tengiz field:

- It was established that biomorphic-detrital limestones and spongolites, when deformed under conditions of uneven compression, demonstrate an increase in void volume by 4-9%, and permeability increases by 70-150%.

- The forecast confirmed the presence of reservoirs with a porosity of 5-12% at depths greater than 6 km, which made it possible to optimize exploration work.

Karachaganak field:

- At a depth of 8 km, the effect of decompaction of carbonate rocks was recorded with an increase in the volume of void space by 0.2-3.5%.

- The technique revealed zones of cavernous-porous-fractured reservoirs associated with long-term breaks in sedimentation.

3.2. West Siberia

In the West Siberian oil and gas province, including the Novy Urengoy superdeep well (SUBW), the technique was used to analyze terrigenous-carbonate reservoirs.

Novy Urengoy SSB (well SG-6, depth 7502 m):

1. Methodology:

- A model of thermal evolution of the lithosphere was applied taking into account rifting, intrusive activity (sill in the Early Jurassic) and hydrothermal events (Pliocene-Pleistocene).

- Kinetic spectra of cracking of kerogens of types II and III were used to calculate the generation of heavy/light oil, gas and coke.

2. Results:

- Pur Formation (Triassic): The intrusion of a sill (181 million years ago) caused a jump in HC generation (up to 84%) and the degradation of 97% of light oil. Gas HCs dominate.

- Togurskaya and Tyumenskaya suites (Jurassic): Hydrothermal activity (2.2–0.7 million years ago) increased the generation of light oil and gas. Heavy oil has almost completely degraded.
- Bakhenovskaya suite (Jurassic): High generation potential (Corg up to 12.6%). The threshold for migration of liquid hydrocarbons was reached 65 million years ago.

3.3. Timan-Pechora Province

1. Methodology:

- Micropetrographic, geochemical and petrophysical core data were used.
- Bitumen occurrence forms (veins, pores, cracks) and their relationship with thermal destruction of oils were analyzed.

2. Results:

- Kolvinskaya well (7057 m): Pyrobitumens, products of oil deposit destruction at temperatures $>180^{\circ}\text{C}$, were found in Silurian deposits (deeper than 6 km). The “deadline” boundary for oil ($R^{\circ} > 1.2\text{--}1.4\%$) was reached at a depth of 4.9 km.

- En-Yakhinskaya well (8250 m): Insoluble bitumens, presumably relics of a destroyed deposit, were found in Triassic deposits (5560–5740 m). The reservoirs retained increased porosity (up to 12.5%) despite the depth.

Conclusion

The developed technique integrates paleogeographic, experimental and statistical approaches, which allows to increase the accuracy of forecasting the properties of carbonate reservoirs at very large depths. Further improvement of the technology is aimed at studying the influence of physicochemical processes and optimizing the criteria for assessing the reservoir potential. The introduction of such techniques helps to increase the efficiency of exploration work for oil and gas in deep-seated complexes of Russia.

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机器视觉在分析卫星和无人机图像在环境保护问题中的应用
**APPLICATION OF MACHINE VISION FOR ANALYZING
SATELLITE AND DRONE IMAGERY IN ISSUES OF
ENVIRONMENTAL PROTECTION**

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摘要：本文涵盖了当前用于科学研究的卫星和无人机区域图像技术水平的数据。通过这种方式获取的图像展现了关于生态系统状况的宝贵信息，但处理高质量的数据以供进一步分析需要耗费大量时间和资源。借助机器视觉这一新趋势，简化了信息处理流程以供进一步分析，从而节省了初步数据处理的时间，并将释放的资源用于指导分析和研究活动。

关键词：卫星系统、卫星星座、无人机、生态学、环境实践、植被指数、生态系统保护。

Abstract. *the article contains data on the current level of technologies for satellite and unmanned aerial vehicle images of territories for scientific purposes. The images obtained in this way display valuable information about the state of ecosystems, but the processing of high-quality data for further analysis takes significant time and requires certain resources. With the help of a new trend, in the form of machine vision, it becomes possible to simplify the process of processing information for further analytics, which allows saving time on preliminary data processing and directing the released capacity to direct analysis and research activities.*

Keywords: *satellite systems, satellite constellations, unmanned aerial vehicles, ecology, environmental practices, vegetation indices, ecosystem protection.*

The relevance of the research topic is considered high, due to the increased interest in the environmental agenda and methods of monitoring the state of the

environment. The high technological level of remote sensing processes and the significant increase in the data obtained using surveys are noted, which indicates the expansion of the use of these methods and tools in the field of environmental monitoring. The main objective of the presented study is the possibility of significantly greater automation of the processes of obtaining high-quality environmental data through the use of artificial intelligence and machine vision technologies.

Today, the process of remote sensing of the Earth is becoming increasingly relevant. In addition to traditional satellite constellations, unmanned aerial vehicles can also be used to obtain images and read various types of information from them, due to their low cost and the possibility of a more detailed study of the resulting image. Thus, a significant accumulation of data occurs, affecting the qualitative characteristics of the state of the environment. All high-quality environmental data require various preliminary preparations, in the case of satellite materials or UAV images - in image processing [1].

The differences in obtaining data from satellite images and UAVs are in the following indicators: accuracy, scale, cost, resolution, flexibility of use. Satellite images are capable of providing results of large-scale surveys with the required accuracy. For such results, it is possible to use most domestic and foreign platforms with satellite images, as well as direct purchase of remote sensing data. A number of spacecraft use special technologies for surveying, which are often inaccessible to unmanned aerial vehicles - infrared survey, hyperspectral survey, thermal survey. Due to the presented features, satellite systems remain indispensable in matters of cartography and analytics of large areas [2]. For example, emergency situations with oil spills or forest fires can be most accurately assessed only with the help of satellite groups. The main difficulty in obtaining satellite data of the object or territory under study is the high cost of surveying and processing processes. In addition, satellite images do not always allow studying small regions or forms of anthropogenic impact. Particularly difficult data for obtaining high-quality information from satellites are issues of animal monitoring, including rare species. Surveys using UAVs have characteristics and advantages that differ from satellite images. First of all, it is worth noting the ability to cheaply obtain high-quality images in a small area, where representatives of local fauna, illegal activities, and anomalies in the development of ecosystems can be distinguished. Depending on the built-in equipment, the drone is capable of providing almost any required resolution, which in turn allows for the analysis of vegetation indices. Obtaining a number of vegetation indices, such as NDVI or NDWI using a UAV image, speeds up the data processing process due to the smaller scale and simplification of the selection of the index sensitivity to atmospheric, hydrosphere, or weather factors. Considering the difference in the speed of flight over the territory, the drone is capable of sending a significantly larger number of photos and videos of the stud-

ied territory, there is also the possibility of stopping or changing the UAV route, due to the need to conduct a more detailed study of the territory. It should also be noted that the cost of both the UAV itself and its components, as well as its photo, is much lower.

Table 1 presents the advantages and disadvantages of the methods under study in the issue of environmental monitoring of the quality of the state of ecosystems and the environment. Separately, it should be noted that it is impossible to replace one method with another due to the characteristic parameters for satellites and UAVs.

Table 1.
Advantages and disadvantages of satellite and drone images (developed by the author).

Data type	Advantages	Disadvantages
Satellite image	The availability of the most modern devices for shooting in high resolution and different ranges; Compliance with almost any requirements for the scale of images; The most effective means of assessing the consequences and predicting accidents and natural disasters[3]; Efficient means of assessing the quality of reclamation processes; The ability to calculate most vegetation indices based on images [4].	High price; Longer image processing process; Very high price of the spacecraft and its launch; High complexity of identifying representatives of fauna in the studied ecosystems; Linking the shooting to orbital revolutions.
Photographed using a UAV	Low cost of the device; Low cost of images and videos; The ability to assess the number of fauna representatives, including rare species; The ability to change the research route; The ability to use significantly more frequently; The ability to customize the drone equipment using many modern technologies.	Long data processing process; Lack of high-tech devices for images in different spectra; Requirements for competent operator control; Limited operating time.

Each method of obtaining images has a number of advantages and disadvantages, but their data currently require additional manual processing. Processing of an image containing high-quality data on the ecosystem should be divided into the following categories:

- the process of primary image processing in order to obtain basic information about the studied data (atmospheric correction, geometric referencing);
- the process of searching for anomalies associated with any natural processes or human activities;
- the process of obtaining vegetation indices through special processing and fitting of a satellite image to remove the necessary parameters.

The presented processing processes allow us to evaluate images and identify the following data important for environmental protection activities [5]:

- ecosystem degradation;
- the effects of floods and wildfires;
- illegal deforestation;
- poaching in waters prohibited for fishing;
- desertification;
- efficiency of reclamation processes;
- consequences of environmental accidents.

One part of the data is obtained by direct shooting from a satellite or UAV and its subsequent study, while the other requires obtaining the values of vegetation indices from images [6], usually over several years and in different seasons, to obtain the most objective information.

The basis for potential processing of images from satellites and UAVs can be a separately allocated machine vision technology based on training AI using large databases with various mechanisms for processing images.

This artificial intelligence technology should affect the processes of:

- automatic detection of anomalies in images and their comparison with past data [7];
- automatic processing of images in order to obtain vegetation indices, at least the main ones [8];
- identification of representatives of fauna in images in order to estimate their numbers.

Table 2 shows the prospects for the implementation of this method of data processing using AI.

Table 2.
Potential improvement of remote sensing data processing using machine vision (developed by the author).

Indicator	Traditional processing methods	Based on machine vision monitoring
Processing speed	Several days.	Hours/minutes.
Data accuracy	Spot measurements.	Continuous monitoring.

Cost efficiency	High financial and human labor costs during primary processing.	Cost reduction due to automation of a number of processes.
Analytics process	Transition to the analysis process immediately after the completion of the manual image processing process.	Additional time allocated for image analysis by specialists.

A number of conclusions should be made based on the data presented in the table:

- Thanks to technical progress in the field of artificial intelligence, it is possible to refine monitoring data in the field of ecology through advanced solutions.

- The processes of processing the obtained images using machine vision technologies can be significantly accelerated, which can allocate additional resources for data analysis and their placement on environmental monitoring platforms or in scientific interests.

- Improvement of this branch of environmental monitoring affects most issues related to anthropogenic impact, accidents and natural disasters, which allows for the refinement of measures to prevent and respond to these situations.

Thus, the key conclusion from this work should be considered the relevance and possibility of the proposed solution for the use of artificial intelligence in environmental aspects. By training machine vision, it is possible to increase its role in matters of obtaining materials from remote sensing images, which in turn will lead to an improvement in environmental measures by enterprises and the state.

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