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COMPARATIVE ASSESSMENT OF THE TAX SYSTEMS OF THE RUSSIAN FEDERATION AND THE REPUBLIC OF ARMENIA IN THE EAEU SPACE

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The state of the tax system of the RA and the RF for the period 2015-2019 was analyzed, an overview of the main changes in the tax legislation of the RA and the RF from 01.01.2020 was made. Special attention was paid to the issues of tax policy and tax burden in force in the RA and the RF. The analysis revealed different tax rates for taxes in the RA and the RF, the use of types and models of tax policy, which are aimed at increasing the tax burden. Revealed significant differences in the development of the current tax system the RA and the RF. For the further and even development of the EAEU member countries, recommendations are proposed that will help to increase the efficiency of business in the customs territory of the EAEU, as well as allow to obtain positive results.

Keywords: EAEU, budget, tax system, tax legislation, tax policy, tax policy model, tax burden, Eurasian Economic Commission (EEC).

Introduction

Tax legislation is a field of law, the norms of which are constantly being improved. The EEC constantly monitors changes in the legislation of the EAEU member states in this area. Consideration of topical issues is organized at the site of the Advisory Committee on Tax Policy and Administration, created under the EEC. The EAEU Treaty outlined the main principles of indirect taxation, namely: national treatment in the field of indirect taxes, harmonization of excise rates on certain, most sensitive goods, improv-

ing the administration of indirect taxes, taxation of VAT on trade in goods based on the country of destination, as well as at the place of implementation of work and services [4, p. 4]. Speaking about tax harmonization in the EAEU, it should be said that special attention is paid to the approach to the implementation of indirect taxation. Different VAT rates in the EAEU member states are explained by differences in economic systems (the ratio of the market (raw materials) and structural (industrial) components), as well as the ongoing economic reforms. However, it is important to note the tax sovereignty of the EAEU member states.

In the conditions of a single customs territory and the absence of customs control at the border, the issues of administering VAT and excise taxes require special procedures. Therefore, today on the agenda are especially acute issues of information exchange between tax authorities regarding the payment of VAT and excise taxes. The acceleration of the exchange of information is primarily necessary for the exporter in order to be able to provide a VAT refund (exemption from the payment of excise taxes) in a shorter time frame.

With regard to the exchange of information, the tax authorities operate within their own information systems, and it is here that the most important task of the EEC is to establish an effective exchange of information and create an opportunity for the prompt transfer of all flows to the online mode. In addition to improving the electronic exchange of information between tax authorities, it is proposed to consider issues on the further development of service functions of tax authorities, as well as to more actively introduce online checks on the status of applications for the import of goods and payment of indirect taxes. All of this will improve business conduct.

Materials and research methods

Currently, further work is underway to improve the system of levying indirect taxes, including the elimination of unequal taxation conditions for goods imported from EAEU member states and goods of its own production. Within the EAEU, active work is underway to develop a procedure for collecting VAT when providing services in electronic form.

Before analyzing the RF and the RA tax revenues within the EAEU, let's outline the RA and the RF tax system. The RA tax legislation is not codified and according to the RA law of 12.05.1997 № ZR-107 "On Taxes" it consists of this law, as well as laws regulating the application of certain types of taxes [3]. The RA tax system is two-tier, and therefore all taxes are divided into two categories: state and local taxes. State taxes of the RA include: income tax, income tax, excise tax, VAT; to local: property tax, land tax. Tax relationships are governed by: tax legislation; govern-

ment decrees; acts of the authorized state body. It should be noted that, on average, taxes and payments account for 85% of all budget receipts, with VAT accounting for a large share in the structure of tax receipts (about 29.0%); income tax (24.0%); income tax (17.0%) and excise tax (15.0%).

The RF tax system is three-tiered and includes federal, state and local taxes. Federal taxes and fees include: VAT, excise taxes, corporate income tax, personal income tax (PIT), mineral extraction tax (MET), water tax, tax on additional income from the extraction of hydrocarbons, state duty and fees for the use of objects of the animal world and for the use of objects of aquatic biological resources. Regional taxes: transport tax, corporate property tax and gambling business tax; local: land tax, trade tax and property tax of individuals. The RF tax system is based on the RF Constitution, and is regulated by the RF Tax Code and federal laws on taxes and fees adopted in accordance with it. In the RF, there are laws of the RF subjects on taxes and regulatory legal acts of municipal bodies adopted within the framework of the RF Tax Code. A large share in the revenue side of the budget is VAT (15-17%), income tax (10%), PIT (10%) and excise taxes (4-5%).

Prior to the entry into force of the Tax Code, the RA (the RA TC) had separate regulations in the field of taxes (as it was in the RF before 2001), which were adopted more than 20 years ago. From the moment of their adoption, changes and additions were made to them, designed to solve short-term and local problems. With the entry of the RA into the EAEU, new tasks arose that are associated with integration processes, which contributed to the creation of an objective need to regulate tax relations in a new way.

In the Tax Code, the RA entered into force on 01.01.2018, where more than 30 changes were provided, some of which were due to the RA joining the EAEU. Fundamental and radical changes were introduced in terms of tax rates, taxation mechanisms, and the application of fines. The main emphasis in the RA Tax Code is placed on improving tax administration in order to increase government revenues and simplify business. Let's outline some of the changes that have been adopted since 2018:

- 1) a completely new system of accounting for tax liabilities of taxpayers in relation to the state budget has been introduced: instead of several dozen treasury accounts previously used for these purposes, a single treasury account is now used;

- 2) the number of tax settlements submitted to the tax authority has been reduced: instead of calculating VAT and calculating excise tax, there is a single calculation of indirect taxes;

3) taxpayers were issued excise stamps and control signs, which are provided for consumer goods, without advance payments, which thereby allows taxpayers to more efficiently use their financial resources, etc.

Since 2018, transfer pricing (TP) rules have been in effect in the RA [1, p. 18], which apply not only to cross-border transactions, but also, in cases established by the Tax Code, to transactions within the RA. Since 01.01.2019, the basic VAT rate has been increased on the territory of the RF from 18% to 20%, while the preferential rates (10% and 0%) for certain types of goods have been retained. For example, in the RA the standard VAT rate remains the same - 20%, and reduced VAT rates are applied - 1.5%, 3.5%, 5% and 10%. The tax period for VAT is a calendar month (in the RF - a quarter) (see tab. 1).

Table 1
Applicable taxes and tax rate (%) in the RA and the RF

Tax name	Russia	Armenia
VAT	0 %; 10 %; 20 %	20 %
Income tax	20 %	20 %
PIT	13 %; 15 %; 30 %; 35 %	5 %; 23 %
Excise taxes	Depending on the type of excisable goods; rates - fixed, ad valorem and combined	Depending on the type of excisable goods; rates - fixed and ad valorem
Corporate property tax	Does not exceed 2.2% (when calculating the average annual value) and does not exceed 2% (when calculating the cadastral value)	Differentiated rate - from 0.1% to 0.8%
Gambling business tax	Fixed rates depending on the object of taxation	Provided under the special tax regime
Transport tax	Depending on the type of vehicle, the flat rate	Replaced by property tax
Land tax	0.3% and 1.5%	The rate depends on the category of land
Individual property tax	Up to 2 %	Differentiated rate

Table 1 shows that for some taxes the rates are the same in both the RF and the RA. The main changes in the tax legislation of the EAEU member states took place from 01.01-01.09.2019, as well as from 01.01.2020 on taxes levied in mutual trade in accordance with Section XVII "Taxes and Taxation" of the EAEU Agreement of 05.29.2014, in particular: VAT, excise taxes, personal income tax. The RA National Assembly adopted Law № 68-N on June 25, 2019, according to which a number of amendments and additions were made to the RA Tax Code. This Law entered into force on 01.01.2020, but some provisions of this Law entered into force on 29.06.2019 (see tab. 2) [4, p. 13-18; 68-73].

It should be noted that the RF tax system differs from the RA tax system, however, due to international cooperation within the EAEU, a bilateral Convention (Agreement) has been signed between the countries for the avoidance of double taxation and the prevention of tax evasion with respect to taxes on income and capital (property) 12.28.1996; Ratified on 26.12.1997, entered into force on 17.03.1998. Protocol on amendments: signature on 24.10.2011, ratified on 26.02.2013, entered into force on 15.04.2013. Characterizing the tax systems of Armenia and Russia, one should indicate what types and models of tax policies exist in these countries [1, p. 106]:

- in Russia there is a fiscal-redistributive one with elements of a regulatory type; model - maximum tax policy;
- Armenia has a fiscal-redistributive type of tax policy with elements of a regulatory type; model - maximum taxes combined with elements of optimal tax policy.

In our opinion, the most optimal type of tax policy may not be fiscal-redistributive, but fiscal-regulatory, which is aimed at a compromise implementation of fiscal, regulatory and distributive (social) functions. In this case, the emphasis will be on measures to strengthen the regulatory function in order to stimulate economic development. Speaking about the model of tax policy, then of course the policy of reasonable taxes should be applied, which will be a manifestation of a compromise between the fiscal, regulatory and social functions of tax policy. This model is an intermediate form of tax policy between the policy of maximum and minimum taxes and is characterized by a balanced level of tax burden, which does not hinder the development of the economy, but at the same time maintains a significant level of social spending.

Currently, the EAEU space is actively discussing the issue, and at the first stages, the development and implementation of processes for creating a system of labeling and traceability of goods is underway in order to

ensure the receipt of prompt and reliable information about the movement of goods within the framework of economic activities of organizations within the framework of the fight against illegal trade in products, "gray" supplies from non-CIS countries [4, p. 90].

Table 2

Main changes in tax legislation the RF and the RA within the EAEU from 01.01.2020

Tax name	RF	RA
VAT	<p>New rules have been introduced for transactions not subject to taxation (exempt from taxation) VAT (cl. 3 art. 149 of the RF Tax Code).</p> <p>The form of the register of checks has been approved to confirm the 0% VAT rate within the framework of the "Tax Free" system (a VAT refund system that is valid for non-residents of the country when they export goods purchased in the country). The register of checks is submitted electronically together with the VAT return</p>	<p>Only VAT payers are allowed to receive VAT exemptions when imported goods are included in the list of VAT exemptions in accordance with the RA Law "On approval of the list of goods imported by organizations and individual entrepreneurs that are not subject to excise tax, the import of which is exempt from value added tax."</p>
Excise Tax (Excise)	—	<p>Abolished excise taxation with rates expressed as a percentage (new fixed rates approved based on a quantitative tax base). A new system of annual rate adjustments for certain types of goods has been introduced.</p> <p>Taxpayers producing (importing) products subject to excise tax operate under microbusiness and value added tax systems</p>
Personal income tax (PIT)	<p>According to art. 217 of the Tax Code of the RF, non-taxable income includes income in the form of profit of a controlled foreign company that is taken into account when determining the tax base in 2019 for a taxpayer who is a controlling person of such a controlled foreign company (these incomes are exempt from taxation if the taxpayer is not recognized as a tax resident of the RF based on the results of the tax period of 2018)</p>	<p>A gradual reduction in the tax rate of the tax from 23% (2020) to 20% (2023) is envisaged. Dividends received from net profit attributable to periods after 01.01.2020 are subject to a rate of 5% (previously 10%).</p>

Microbusiness taxation system	–	A taxation system for micro-business is introduced (instead of family entrepreneurship and taxation of self-employed persons)
Foreign currency transactions	–	From 29.06.2019, the tax bases and initial values for the import or export of goods from / to the EAEU member countries are determined based on the Central Bank the RA rate as of the date of import of goods into the RA territory (crossing the RA border) or exporting goods from the RA territory (crossing the RA border). A tax offense does not arise if the tax bases and initial values of goods imported / exported from / to the member countries after 01.01.2018 are calculated using the RA Central Bank rate as of the date of the RA border crossing.
Tax administration	<p>Changes have been made to the procedure for calculating the excise tax and the advance payment of the excise tax. The RF Tax Code has been supplemented with a rule stipulating the obligation of the taxpayer to submit to the customs authority a report on the volumes of excisable goods imported into the RF.</p> <p>A new form of notification was approved, which is used in cases when it is necessary to inform about participation in foreign organizations or the establishment of a foreign structure without forming a legal entity. A new electronic format has been adopted, the procedure for filling out and submitting this notification.</p>	–

As a reminder, the requirement for mandatory marking with control (identification) marks on garments made of natural fur for EAEU member states has been in effect since mid-2016. For the first time, a pilot project

for the marking of fur products was implemented on the territory of the RF through the Federal Tax Service of Russia and the Federal Customs Service of Russia, which made it possible to develop approaches to joint control.

Note that in the RA, issues of traceability and labeling are implemented through the adoption of acts at the departmental level through the RA State Revenue Committee. According to Resolution № 807 dated 25.06.2019 "On conducting an experiment on the traceability of goods released in the Russian Federation in accordance with the customs procedure for release for domestic consumption" in the RF, the task is to create a unified standard for customs and tax administration. Currently, the FTS of Russia is obliged to send information about a traceable product to the traceability system of the EAEU member state. This system assumes that the exporter of the traceable product draws up an accompanying document, submits it (or information from it) to the Federal Tax Service of Russia online.

Next, we will analyze the receipts of taxes to the budgets of the RA and the RF and give a little explanation regarding the budgets of these two countries: the republican and consolidated budgets are the budgets that are formed according to the national methodology. Therefore, the republican budget in the RA means the state budget, and in the RF it is customary to call it the federal budget. Budget revenues and expenditures in both the RA and the RF include the sale and acquisition of non-financial assets. The consolidated budget of the RA does not include revenues and expenditures of extra-budgetary units received from their commercial activities, in the RF - public corporations of the general government sector, which, according to the IMF methodology, are taken into account in the budget of the general government sector [7 p. 7]. Considering that there is no information on the structure of revenues for 2019 for the consolidated budget of the RA, the data are presented for the republican budget for the RA in comparison with the RF (see tab. 3) [7, p. 17-18].

Table 3

The share of taxes in the structure of budget revenues of the RA and the RF, %

Indicator	2015	2016	2017	2018	2019
Republic of Armenia					
Income, total	100,0	100,0	100,0	100,0	100,0
including:					
VAT	36,3	33,4	32,8	32,7	32,5
excise taxes	40,2	5,1	6,7	8,1	8,9
income (profit) taxes	8,9	10,9	8,9	12,7	15,0
income from foreign trade	5,3	4,7	5,9	6,0	6,1
other taxes and fees	45,4	45,9	45,8	40,5	37,5
Russian Federation					
Income, total	100,0	100,0	100,0	100,0	100,0
including:					
VAT	31,0	34,0	34,0	30,9	35,1
excise taxes	4,3	5,2	6,5	4,9	3,0
income (profit) taxes	3,6	3,6	5,1	5,1	5,9
income from foreign trade	24,1	19,4	17,2	19,1	14,9
other taxes and fees	37,0	37,9	37,1	40,0	41,0

According to table 3, in general for 2015-2019, there is an uneven dynamics of tax revenues to the RA budget: taxes on profit (income) by 68.5% (in 2017, the decrease was about 41% in relation to 2019), excise taxes by 111.9%, income from foreign economic activity by 115.1%. In terms of VAT and other income, a decrease of 10.5 and 17.4%, respectively, is noted. In principle, an upward trend is being monitored for tax revenues to the RF republican budget, with the exception of revenues from foreign economic activity (a 38.2% decrease). Thus, an increase is noted in income (profit) taxes by 63.9%, VAT by 13.2% and other income by 110.8%. Note that indirect taxes have the largest share in comparison with direct taxes: for example, in 2019 VAT amounted to more than 30% in the RA and the RF; the largest income to the budget for income tax in the RA - 8.9%, in the RF - 5.1%. There is a tendency towards the sustainability of income from foreign economic activity due to the transfer and distribution of import customs duties in the customs territory of the EAEU.

Let us estimate the tax burden of the RA and the RF according to the methodology of the International Monetary Fund (IMF) (see table 4) [7].

Table 4
Tax burden on the economy in the RA and the RF EAEU (% of tax revenues to GDP)

Country	Year						
	2012	2013	2014	2015	2016	2017	2018
According to the IMF methodology							
Russia	37,69	36,93	37,48	33,91	34,49	35,49	35,64
Armenia	20,92	22,20	21,98	21,39	21,58	22,00	22,28
EAEU (average tax burden, excluding Russia)	30,82	30,77	30,64	29,73	29,81	29,84	29,75
According to the methodology used by the OECD							
Russia	31,86	30,80	31,29	28,97	28,51	30,27	n/a

As can be seen from the data in table 4, the level of the tax burden in the RF according to the IMF data for 2018 was 35.64%, which differs from the level of the tax burden calculated according to the methodology used by the Organization for Economic Cooperation and Development (OECD) - 32.72%, in connection with different approaches to determining the total amount of tax revenues. In particular, customs duties, taxes, fees and regular payments for the use of natural resources, contributions to compulsory social insurance can be taken into account in different ways.

In the RA, there is a relatively low level of tax burden, while in the RF it is quite high, which means that the RF tax system does not help to attract foreign investment in the state economy. As noted by Tararyshkin Yu.V. [6], according to the Doing Business index, it is possible to assess the level of competitiveness of the EAEU member countries. According to the World Bank, the Doing Business-2017 rating was compiled for EAEU countries (see tab. 5) [2, p. 16].

Table 5
The value of the "Doing Business" indicator

EAEU member country	Ranking place		International trade		Taxation	
	2017	2018	2017	2018	2017	2018
Armenia	38	47	44	44	90	82
Russia	40	35	100	99	52	53

In the "Doing Business-2019" rating, the EAEU is ranked 31st out of 190 economies [8, p. 36]. Compared to the 2018 rating, there was an improvement by 4 positions, due to the positive dynamics in the rating of all EAEU member states. The highest position among the EAEU member states in the "Doing Business-2019" rating is held by the Republic of Kazakhstan (28th place), followed by the RF (31st place), Republic of Belarus (37th place), the RA (41st place), Kyrgyz Republic (70th place). The indicator "Taxation" allows to assess the quality of tax administration, as well as the level of tax burden on business in the country. As can be seen from the data in table 5, the best values for the indicator "Taxation" were shown by the RA, while in Russia it is quite low. In general, this shows the development of the tax mechanism, in connection with which it is necessary to take serious measures to improve it, in particular: elimination of tax barriers; optimization of taxation and elimination of double taxation; more effective interaction of customs and tax authorities of the EAEU member states to improve tax administration.

Conclusion

To improve the development of taxation for the RA and the RF in the EAEU space, it is necessary to bring the state of tax legislation to uniform standards, and in our opinion, the following solutions are possible in this direction:

1) the most optimal type of tax policy can be fiscal-regulatory, aimed at a compromise implementation of fiscal, regulatory and distributive (social) functions; the policy of reasonable taxes will allow balancing the level of the tax burden, which does not hinder the development of the economy, and will allow maintaining a significant level of social spending;

2) it is necessary to eliminate unequal conditions of taxation of goods imported from EAEU member countries and goods of its own production;

3) in order to improve the development of the tax mechanism, it is possible to optimize taxation and eliminate double taxation; more effective interaction of customs and tax authorities of the EAEU member states to improve tax administration.

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**METHODOLOGICAL SUPPORT OF DISTANCE LEARNING
AS RESOURCE FOR THE FORMATION OF AN EFFECTIVE
INFORMATION AND EDUCATIONAL ENVIRONMENT (FROM THE
EXPERIENCE OF THE AI APE KHMAO - UGRA "INSTITUTE OF
EDUCATION DEVELOPMENT")**

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The article reveals the experience of using distance educational technologies in the educational process in the implementation of additional professional education programs in the Khanty-Mansi Autonomous Okrug - Ugra. Distance informational-methodical (educational-methodical, organizational-methodical) technologies are presented.

Keywords: educational process, distance educational technologies, distance learning, additional professional education, information and educational environment.

Globalization, new technologies and innovations, new thinking and a new attitude to the ongoing changes, the dynamism and interdependence of these changes - all this is already a reality that determines the need for a new approach to the organization of educational activities in the system of additional professional education.

Continuity of professional development, the study of new pedagogical technologies, including digital, new approaches to the organization of

educational activities in general and additional education organizations are becoming the norm of pedagogical life and require the actualization of the personal, creative and professional potential of the teacher.

In these conditions, distance learning technologies are becoming more and more confident.

In accordance with the provisions of Article 16 of the Federal Law of December 29, 2012 № 273-FZ "On Education in the Russian Federation", organizations engaged in educational activities have the right to use e-learning, distance learning technologies for all forms of education in the implementation of educational programs in the manner prescribed by a federal executive body responsible for the development of state policy and legal regulation in the field of education.

E-learning is understood as the organization of educational activities using information contained in databases and used in the implementation of educational programs and information technologies, technical means, as well as information and telecommunication networks that ensure the transmission of this information through communication lines, interaction between students and teachers.

Distance learning technologies are understood as educational technologies implemented mainly with the use of information and telecommunication networks with indirect (distance) interaction between students and teachers.

When implementing educational programs using exclusively e-learning, distance learning technologies in an organization carrying out educational activities, conditions must be created for the functioning of an electronic information and educational environment, including electronic information resources, electronic educational resources, a set of information technologies, telecommunication technologies, appropriate technological means and ensuring the development of educational programs by students in full, regardless of the location of the students.

The autonomous institution of additional professional education of the Khanty-Mansiysk Autonomous Okrug - Ugra "Institute of Education Development" (hereinafter referred to as the Institute) professionally and flexibly responds to modern challenges to the education system. The employees of the Institute actively and appropriately use various remote technologies to organize events in the main areas of activity: educational, educational-methodological, scientific-methodological and organizational-methodological, providing formal, non-formal and informal education for workers in the educational system both the Khanty-Mansiysk Autonomous Okrug - Ugra, as well as other subjects of the Russian Federation.

Distance learning is an opportunity to create a system of mass continuous self-education, general exchange of information, regardless of time and space zones. Distance learning is today not only a significant and promising direction for improving the professional skills of managers and teachers in the education system, but also a factor influencing the improvement of the quality of education. In addition, the distance learning system gives equal opportunities to all people regardless of social status (schoolchildren, students, adults: workers and employees, unemployed, etc.) in any districts of the Khanty-Mansiysk Autonomous Okrug - Ugra, the country and abroad, realize the human rights to education and information. It is this system that can most adequately and flexibly respond to the needs of society and ensure the implementation of the constitutional right to education of every citizen.

The use of distance forms of professional development orientates adult learners towards self-education. Among the motives that determine the teacher's choice of distance learning based on distance, digital educational technologies, one of the first places is occupied by the desire to follow the student, accompany him in educational activities along an individual educational route, taking into account his requests and needs.

Today, the activities of the Institute are focused on the continuity of professional development of educators, first of all, on the formation of the teacher's readiness to act not only in his usual role, but also in the role of a mentor in the process of disclosing and developing the personal potential of students, as well as in the role of organizer of productive interaction of all participants of educational relations. At the same time, an important aspect is the motivation and support of the educational activity of the teacher as an indicator of his creative self-realization, the ability to adequately choose resources for organizing educational activities, including resources that ensure network interaction of participants in educational relations and the formation of a communicative culture.

It is equally important to take into account the specifics of distance learning in the system of advanced training of pedagogical personnel, namely:

- teaching staff should not only improve their own professional competence in a distance form, but be ready to use this form of education in their own teaching practice;
- teaching staff must be competent in the field of teaching the subject (course), therefore, it is important to take into account the specifics of the subject content and its mastering by the student.

What remote technologies are used at the Institute?

Internet technologies (network technologies) – are distance educational technologies that are implemented using global and local computer networks to provide users with access to information resources, including educational ones, and to form a complex of educational, methodological, informational, organizational and other means of implementing educational activities, regardless of location of participants in educational relations.

Telecommunication technologies – are distance educational technologies that are implemented using space satellite data transmission and television broadcasting, as well as global and local networks to ensure interaction of students with the teacher and among themselves and students' access to information educational resources presented in the form of digital libraries, video lectures and other means and methods of organizing educational activities.

Pedagogical technologies of distance learning – are technologies of indirect and direct communication, which are implemented using electronic telecommunications and specialized didactic resources.

Remote informational-methodical (educational-methodical, organizational-methodical) technologies – are technologies for creating, transferring and storing educational materials, organizing and supporting educational activities:

- *online learning management system "Moodle"*, allowing to create electronic educational and methodological complexes, dynamic courses;
- *communication application "Adobe Connect"*, allowing for video conferencing, remote lectures and workshops, webinars and other collaboration sessions;
- *"Zoom" platform*, allowing to organize virtual and hybrid classrooms for educational work, as well as methodological events, administrative meetings, etc.;
- *"Miro" interactive whiteboard, "Padlet" service*, allowing to organize project and team work, visualize educational activities, including interactive feedback techniques.

E-library – is an information system that allows you to save and effectively use a variety of collections of electronic documents (text, visual, audio, video, etc.) localized in the system itself, as well as available to it through telecommunication networks. The main task of the Institute's electronic library is the integration of information resources intended to provide educational activities with the necessary literature (information), as well as to assist in raising the level of professional development of educators and the teaching staff, expert and methodological staff of the Institute.

Electronic database – is a set of electronic documents for educational and methodological purposes, linked by a system of automated document flow and management of educational activities.

Interactive multimedia courses – are educational and methodological complexes, presented in the form of a hypertext structure with multimedia applications, provided with a system for navigating the course and managing its various components.

What forms of organizing remote events are used at the Institute?

Webclasses (webinars) – distance learning sessions, conferences, seminars, business games, workshops, master classes and other forms of training sessions conducted using telecommunications and other Internet capabilities.

Chat-classes – training sessions carried out using chat technologies, including using the such services as Adobe Connect, Zoom.

Teleconferences – are activities that allow remote group communication; are conducted, as a rule, on the basis of mailing lists using e-mail. Educational teleconferences are characterized by the solution of educational problems. There are also forms of distance learning, in which educational materials are sent by mail.

Skype (Viber, WhatsApp) conferences – are events that allow for group communication and create communication for various participants to solve operational problems, discuss various issues, and hold meetings of employees.

Situations of uncertainty, instability of the surrounding reality, on the one hand, have an impact on the processes of transformation of activities, on the other hand, they become a resource for overcoming crisis situations, professional and personal growth of the Institute's staff.

Today the Institute, as a subject of the educational policy of the Autonomous Okrug, is in search of effective solutions for the development of the education system focused on the implementation of digitalization models, personalization of educational activities.

The Autonomous Okrug is a vast territory remote from the central cities and large educational organizations, which has its own climatic characteristics, which in turn imposes certain features on the organization of continuous professional training of teachers of the Autonomous Okrug. The organization of the educational process with the use of distance learning technologies makes it possible to level these difficulties and build individual educational trajectories for teachers. This is reflected in the constantly growing number of teachers who improve their qualifications according to programs implemented by the Institute (fig. 1).

In general, the Institute has created a unified information and educational environment that provides a personalized approach to the continuous professional development of management and teaching staff, including highly qualified faculty, expert staff, consulting, methodological services, as well as all kinds of electronic resources (including network) : virtual libraries, scientific and methodological sessions, scientific and practical conferences, seminars, pedagogical workshops, electronic educational and teaching aids, methodological recommendations, navigators of effective practices of regional innovation platforms, best practices of educational organizations and teachers in various areas (implementation of ethnocultural component of the content of educational activities, inclusive education, etc.), the network professional and pedagogical community of Ugra "Shkollegi", databases, etc.

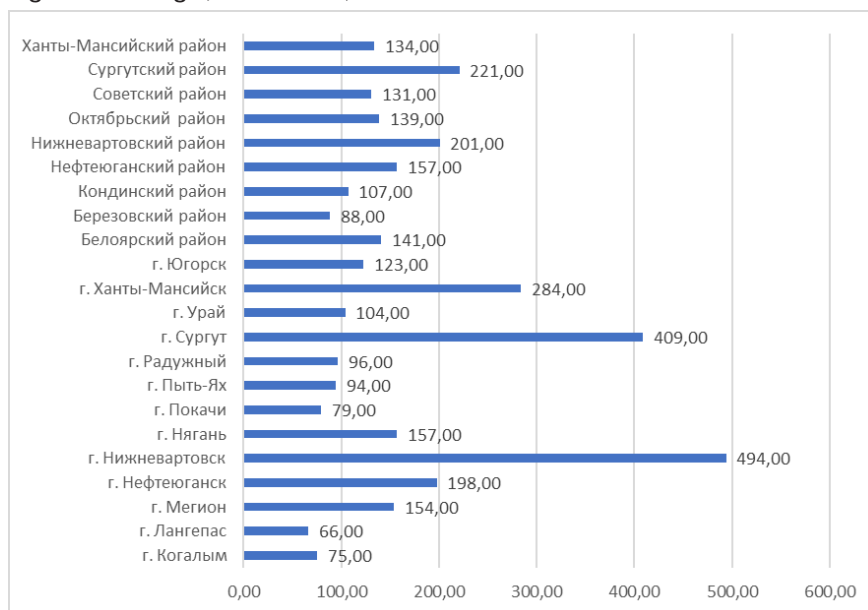


Fig. 1 The number of students trained in 2019 on programs of additional professional education using distance learning technologies at the AI "Institute of Education Development"

Characterizing the information and educational environment of the Institute, its flexibility, mobility, transformability, targeting should be noted. These are the qualities and principles, the management of which maintains the consistency of the educational and scientific-methodological activities of the Institute in conditions of uncertainty and instability.

We should note the positive dynamics of the participation of employees of the education system of the Khanty-Mansiysk Autonomous Okrug - Ugra and other subjects of the Russian Federation in the events organized by the Institute.

Thus, the methodological support of distance learning is an effective resource for the formation of an effective information and educational environment.

All this is, on the one hand, an indicator of the effectiveness of the Institute, on the other, a motivating factor for the continuous professional development of its employees.

HIGHER SCHOOL OF KAZAKHSTAN IN THE CONTEXT OF GLOBALIZATION OF EDUCATION AND QUALITY ASSURANCE

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The state of Kazakhstan higher education is analyzed in the context of globalization processes. The expanding massization of higher education and its availability exacerbate the problem of ensuring the quality of education. The issues of the transition to the competence model of the graduate, the development of the National Quality Assessment System, and the increase in the effectiveness of social partnership between higher education and the world of work are discussed. The main reasons that reduce the effectiveness of educational reforms are considered.

Keywords: quality of education, educational reforms, globalization and mass character, independent accreditation, university - employer, teacher - student.

Over the past 10 years, which have passed since the signing of the Bologna Declaration by Kazakhstan, major changes have taken place in Kazakhstan higher education. These include the transition to a three-level training system (bachelor's, master's, PhD), the introduction of state educational standards that allow universities to form their own educational programs within the existing consolidated areas of training, an improved National Quality Assurance System, which includes independent accreditation of universities and educational programs, and a socially oriented policy that allows a significant number of graduates of secondary schools to become university students every year.

Leaving aside the issues of academic mobility of teachers and students, the problem of employment of graduates and the principle of the unity of educational and research processes, we can state the following: the quality of higher education, the level of training of university graduates in general is much to be desired. There are many reasons.

Modern higher education is generally regarded as a social good and a service. In accordance with this, the goal of higher education and learning outcomes are formulated. The triune goal is training, education and development [1]. The purpose of the training is the formation of knowledge, skills and abilities of students. The purpose of education is the formation of the personal qualities of students, norms and rules of behavior. The development goal is the development of cognitive abilities and readiness for continuous education throughout the entire working life. All these three goals, which are of a teaching, educational and developmental nature, are realized in a single educational-research-educational process.

In an era of rapid global changes, the problem of building up the intellectual potential of society is becoming urgent. The key role here is played by higher education, the main competitive advantage of which is the quality of education.

In world practice, considerable experience has been accumulated in assessing the quality of education according to various criteria. However, there is still no coherent unified system of criteria-based quality assessment. Many experts note the extreme complexity of this task, one of the reasons for which is the presence of distinctive features of national education systems. Nevertheless, the main components of quality, such as the professional level of the teaching staff, the material and technical equipment of the educational process, its educational and methodological support, professional qualities and the demand for graduates, are characteristic of the educational systems of most countries [2]. Assessment of the quality of education in US universities is carried out mainly according to six criteria: mission and goals, faculty, content of curricula, educational and methodological support, students and graduates, the intellectual product of the university. In the UK, the quality of educational services is assessed by the volume of research, the number of doctors of science, the ratio of the number of students to the number of staff, the rating of teachers, the share of foreign students, etc. In German universities, the emphasis is on research achievements, practical adaptation, student activity, the level of administrative control and etc.

The quality of education is a complex characteristic of educational activities and training of students, expressing the degree of achievement of

the planned learning outcomes. The quality of education for students is, first of all, knowledge, skills and practical skills necessary for successful employment. In other words, the student perceives quality as readiness for obtaining a prestigious job and career growth. For employers, quality education is associated with the training of specialists who have the necessary competencies and are able to work in a team, adapt to dynamically changing production conditions and are ready for continuous professional development.

Ideas about quality vary not only by groups of participants in the educational process, but also taking into account the time factor. Currently, the priorities in the interpretation of the quality of education are shifting towards the characteristics of the graduate's abilities. It is not only the amount of acquired knowledge that comes to the fore, but also key competencies, creativity and the ability to educate yourself.

Recently, about 80% of the total number of school graduates in Kazakhstan annually become students. Post-Soviet realities associated with falling industrial production and demographic decline have not diminished interest in higher education. In conditions of insufficient budgetary funding, the mass character is perceived in higher education as an opportunity to retain the teaching staff for the reproduction of the country's intellectual potential. Higher education in the context of the formation of an innovative economy is becoming the most important industry that ensures the growth of human capital.

The existing educational standards and programs reflect the interests and capabilities of universities to a greater extent than the real needs and requirements of the labor market. Not all employers are willing to formulate requirements for today's graduates. There is still a dependent approach - to get a ready-made specialist who can immediately get involved in work. The efficiency of social partnership between higher educational institutions and employers in the context of modernization of education will increase significantly if employers turn from outside observers and passive consumers of educational services into interested partners [3]. The synergistic effect of the strategic partnership between the university and the employer is possible on the basis of the principles of mutual benefit, long-term and high responsibility of stakeholders. Otherwise, such a partnership will play a decorative role of transformation.

The main responsibility for the quality of education lies directly with universities. In Kazakhstan higher education, in a situation of abandoning state educational standards for specialties, the role of the university and its teaching staff significantly increases in terms of developing the content

of educational programs and revising it on a regular basis, taking into account the requirements of the labor market.

The paradigm of lifelong education involves the formation of partnerships between the subjects of the educational process. The teacher should contribute to the acquisition of knowledge, skills and competencies, and the student should be motivated to obtain this triad. The main task of the teacher is to make the student want to learn, to immerse himself in an active learning process.

The system of increasing motivation for the active acquisition of knowledge and professional competencies is insufficiently developed, the effectiveness of the monitoring is low, student-centered teaching is not fully implemented.

Kazakhstan higher school in line with European trends is at the initial stage of transition to the competence model of a graduate. In the normative legal documents, this problem is poorly indicated. There is no generalizing pedagogical research on the transition of higher education to a competence-based model of education. The materials available now on its implementation in the educational process are largely declarative.

The competence-based approach in higher education is a unified educational process that takes into account the qualification characteristics of a university graduate in the format of competencies (general educational social and personal competencies based on the State Standard, and professional competencies based on approved professional standards, employers' requirements and the social demand of society). The current State Standard of Higher Education, which is very framework in nature, provides universities with significant freedom in the formation of educational programs. In such a situation, the content filling of the volumetric university component in accordance with the given learning outcomes in the format of competencies and objective diagnostics of the formed learning outcomes are extremely important. There is an opinion that competence as an integral characteristic of learning outcomes can be objectively assessed in the process of active labor activity of a university graduate. In the context of pedagogical technologies, it is more expedient to talk not about the achievement of planned learning outcomes, but about the creation of a favorable educational infrastructure and learning technologies that contribute to its achievement [4].

The problem of quality assurance is closely related to the Concept of lifelong education (lifelong learning), officially adopted by UNESCO as a strategic element designed to improve the structure and content of the education system, to make it flexible and responsive. UNESCO experts

believe that “lifelong learning” is the guiding principle of the education economy, in which the learning process is interspersed with the work process in time and space, and knowledge and competencies are acquired through a variety of forms and methods of learning, including self-education.

In the context of globalization, the processes of transformation of national higher education systems are inevitable, in particular, the methodology for assessing and guaranteeing quality. During the Yerevan Conference of Ministers of Education of the countries participating in the Bologna Process, recommendations were discussed for strengthening international cooperation in the field of quality assurance in education, based on the responsibility of universities for quality, the development of an intra-university system of its provision, student-centered learning, the involvement of all major stakeholders in quality assurance processes and innovative methods of teaching [5]. This actualizes the need to strengthen external quality assessment by independent accreditation bodies. In the system of higher education in Kazakhstan, independent accreditation has been transferred to a competitive environment, which provides a public and professional assessment of the quality of education, the distinctive features of which are independence, objectivity and transparency. This approach helps to increase the competitive advantages of universities - attractiveness for applicants and the demand for their graduates from employers.

The developed system of independent assessment of the quality of education makes it possible to ensure progress at all levels of education and contributes to increasing the competitiveness of Kazakhstan higher education. The accreditation process will be most useful for universities if quality standards are a kind of ideal models for educational programs. The accreditation procedure is becoming an instrument of competition, since universities provide additional guarantees of the quality of education and an important element in the regulation of the educational services market. It seems relevant to improve accreditation standards in the direction of strengthening student-centered learning, the quality of the organization of the educational process, the quality and relevance of educational programs, the quality of teaching and infrastructure support.

The strategic direction of reforms in the higher education system in the context of globalization and expanding massization is associated with improving the quality of education and its competitiveness. Such a large-scale work provides for the further integration of Kazakhstan higher education into the European space of higher education in the context of

the Bologna process, the development of the National Qualifications System, social partnership of higher education and the world of work in the direction of combining professional and educational standards and the introduction of new generation educational programs in the format of a competence-based approach and student-centered learning. This approach focuses on the results of education, which are not considered as the amount of information acquired, but a person's ability to work successfully in the chosen professional field on the basis of the knowledge and skills acquired.

Modernization of the domestic higher education system is constrained by motivational barriers and internal contradictions caused by the underdevelopment of social partnership between higher education and the world of work and the low social status of the teaching staff. Demotivational factors are also created by the unpreparedness of the student body for active study in order to obtain knowledge and professional competencies in the chosen learning path and poor cognitive independence.

The mass character of higher education observed today and its liberalism, the development of the paid education sector add urgency to the problem of quality assurance [6]. The national system for assessing the quality of education, which includes various monitoring and evaluation procedures (licensing, accreditation, licensing control, external assessment of educational achievements, unified national testing, ratings, etc.) is designed to monitor institutional quality parameters at various stages of the activities of universities.

It should be admitted that the face of higher education, integrated into the international educational space, has changed and now additional reserves are needed for improvement. A well-defined methodology of licensing and control based on an updated legal framework with the elimination of outdated standards in combination with independent accreditation of universities and educational programs should become reliable tools for assessing and ensuring the quality of education.

Globalization and integration processes pose a set of complex problems for higher education that cannot be solved within the framework of individual national systems. A unified higher education strategy and international coordination are needed to shape a global higher education.

In the context of globalization, the importance of higher education is growing significantly. Higher education is designed to prepare a new generation of professionally literate educated people for a world that is increasingly turning into a world without borders. The dominant process of globalization is the increasing intensity of knowledge. Integration pro-

cesses in the context of the globalization of education are not easy in terms of practical implementation. Educational integration and unification of national systems presuppose an interaction in which any educational system should be accumulated by the strengths of the interacting subjects. In the minds of the scientific and pedagogical community, harmonization is often identified with unification, which, like a gray monotony, can destroy the creative principle. In other words, harmonization should be understood as a movement that destroys existing disharmony. Here is what P. Zgaga notes: "In the era of globalization, it is necessary to strive for maximum compatibility of higher education systems. This will allow all participants to take full advantage of cultural diversity and differences in research and teaching traditions, to steadily improve the quality of education, facilitate student mobility and provide youth with universally recognized qualifications"[7].

Higher education in Kazakhstan officially joined the Bologna process in March 2010, becoming the 47th country participating in the formation of the pan-European educational process. This confirms, as it were, the fundamental readiness of higher education in Kazakhstan to follow globalization trends, in particular the social function of education, common approaches to ensuring a comparable quality of education, continuity of education throughout life, and the continuity of educational and research functions.

Despite the commonality of a number of key principles that served as the basis for the development of integration processes, the formation of a common European space for higher education is proceeding relatively slowly. There seems to be more positive than negative in this. After all, any national system of higher education is a very inertial system, which should be characterized by healthy conservatism. We need a clear understanding that Kazakhstan is a Eurasian country. One should not mechanically copy Western experience at a rapid pace. The administrative format of accelerated modernization without support from universities and the academic community can lead to superficial decisions. How not to recall here the statements of the well-known reformer of the FRG, L. Erhard: "Any reforms are doomed to failure if citizens do not know about them and if they do not support these reforms."

Nowadays there is a tendency of transformation of higher education into a mass phenomenon, an obligatory attribute of the Kazakhstan society. In the context of the globalization of education, the expanding mass character and accessibility of higher education, methodological problems of quality and real practices of its provision should become the main pri-

orities of educational reforms. Introduce at an accelerated pace in universities a culture of education quality as a shared value and collective responsibility of all subjects of the educational process.

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SPECIAL FEATURES OF REALISING PRACTICE-ORIENTED TECHNOLOGIES IN UNIVERSITY TRAINING OF TEACHERS-TO-BE

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The article is aimed at the problem of implementing practice-oriented technologies in teacher training. The authors consider the methods of group work and the technology of pedagogical workshops, allowing students to form their own experience of professional activity and value attitude to the profession.

Keywords: practice-oriented teacher training, practice-oriented technologies, technology of work in small groups, technology of a pedagogical workshop.

The practice of graduates' employment makes it obvious that employers are in need of personnel who already have some experience in solving professional pedagogical problems. Modern professional education should serve not only as the location where the space of knowledge is organized, but also provide the space for activities and personal meanings. The way to overcome the problem may be in practice-oriented training, which provides not only the formation of students' skills, but also the ac-

quisition of experience in solving professional problems and the formation of a professional and personal position of a teacher.

Practice-oriented training of a teacher is considered to be a process of interaction between the subjective professional and personal positions of a teacher and a student in their co-existence, aimed at forming and developing a value-semantic attitude towards professional and pedagogical activity. Practice-oriented teacher training is an integral and complex process that makes it possible not only to bring the content of academic courses to the future profession as much as possible, but also to reflect on the technologies of university teacher training, the fundamental features of which are: the move to getting integrated knowledge, students' freedom to choose educational trajectories and the collaboration of teachers and students in the educational process. Practice-oriented technologies enables organizing teacher training as an event-based process that ensures the joint stay and joint participation of teachers and students, their co-existence in the same time and the same place, filled with a certain meaning and goal setting, structured in a special way. [4]

Among practice-oriented technologies aimed at forming professional and personal position of a teacher and the experience of professional activity the methods of working in small groups and a methodological workshop should be considered here.

As for practice-oriented training of a teacher in organizing group work at a university, I.A. Zimnyaya states that "it has been proven that comparing to individual work based on "the teacher-student" scheme, group cooperation in solving the same problems increases its effectiveness by at least 10%" (*here and further on the translation from Russian is mine – I.Ts.*). [3] The meaning of work in small groups is that a person can transfer the experience to the outside world and use it successfully after acquiring it in purposefully created conditions.

"Small group" usually refers to a relatively stable, small group of people whose members are in direct interaction with one another. [7] The association of students in a group can have both a relatively permanent (creative laboratory or a problem group, acting throughout the entire period of studies) and temporary (within the time limits of one lesson) character.

The developmental and educational effect of students' work in small groups is based on the following advantages of this approach.

1. High activity of all participants in the educational process, due to the presence of a single goal and common motivation; dividing the process between its participants in accordance with the individual capabilities, experience and methods of group members; taking responsibility for the general result.

2. Comfort - working in a group, the participants are more confident, psychological learning barriers are removed, various opinions are accepted and appreciated by the group, which leads to establishing a close psychological contact.

3. Development of personal qualities and increasing self-esteem. Everyone has the opportunity to learn both the leading role and the role of an ordinary participant in a group situation, develop the ability to open interaction with others while maintaining their own individuality, learn to obey their personal interests to the interests of a common cause, and build constructive communication.

4. Development of speech, communication skills of all participants in the educational process (the ability to speak in front of an audience of students is developed as well as the ability to concisely and clearly express their thoughts).

5. Deeper study of the academic material due to repetition and application of the knowledge gained, consideration of the issue from different points of view [7].

One of the techniques for organizing training in small groups was developed by prof. Eliot Aronson and named *Jigsaw*. In pedagogical practice, this approach is commonly called "saw".

The educational material of a specific topic is divided into 6 parts - logical or semantic fragments. Their number should correspond to the number of people in a group, which a teacher preliminarily forms as heterogeneous ones, based on the students' abilities. Each member of the group independently studies his/her part of the topic. Such work can be organized as home assignment for a lesson. Tasks are given in accordance with the desire and individual capabilities of students.

Individual work of students is the first, preparatory stage for the direct organization of classroom work in groups. The activities of group members are structured as follows: the work begins with a "meeting of experts". Students who have studied the same issue, but who are in different groups, meet and exchange information received as experts on this issue, enriching and complementing each other's knowledge, while they have the right to use the drawn up plans, notes, theses, illustrations and other sources, disclosing the issue. Then they return to their groups and teach everything new that they themselves have learned to other members of their groups. Each states his own part of information obtained so that it turned into the status of knowledge. The rest of the group members listen attentively to partners, make notes in notebooks and ask clarifying questions. At this stage, no additional effort on the part of a teacher is

required. Students should be motivated to ensure that their group mates do their best to fulfill their tasks, as this may affect their final grade. Each individual and the entire team as a whole reports on the topic. At the final stage, the teacher can ask any student of the team to answer any question on this topic.

In 1986 R. Slavin modified this method into "Saw-2", which uses the work of students in groups of 4-5 people. In contrast to the first version, at the initial stage, the whole team works on the same material, but at the same time, each member of the group receives a topic that he develops especially carefully and becomes an expert in it. Meetings of experts from different groups are held then. At the end of the cycle, all students take an individual checklist testing, which is graded. The results of all students are summarized. The team that manages to achieve the highest score is rewarded. [6]

In the context of a practice-oriented approach, the organization of work in groups presupposes the emergence and development of students' professional value meanings of using group work and is carried out in stages:

1. Organization of classes by the teacher on an academic course using technology of teaching in small groups.
2. A lesson based on the technology of teaching in small groups, developed and modeled by students in their classroom.
3. Educational or extracurricular activities for schoolchildren based on the technology of teaching in small groups, developed and modeled by students.

The academic course called Features of Work with Younger Schoolchildren Having Special Educational Needs has pedagogical and subject-specific opportunities for organizing group work in the classroom.

The study of each topic is carried out in accordance with the highlighted stages. The initial study of the topic involves learning theoretical material in the process of group work. An example is the lesson on inclusive education.

The educational material on the topic is divided into 5 units:

1. The essence and content of the concept of "inclusive education";
2. Principles of inclusive education;
3. Models of inclusive education;
4. Problems and prospects for implementing inclusive education in Russia;
5. The experience of implementing inclusive education in the Tyumen Region;

In accordance with the number of units, a few days before the lesson,

groups of five people each are formed. Students carry out an independent search for material and preparation for their part of the topic.

Immediately before the lesson, the desks in the classroom are placed next to each other for 5 groups, so that members of one team can freely communicate in the process of joint activities. Each group prepares a badge-holder for its tables with its number or name.

The lesson begins with an "expert council" in which students complement and enrich each other's knowledge. To do this, one expert sets out the main aspects of the question having been worked out, the rest are to correct and supplement his answer.

Returning to their groups, everyone expounds their part of the topic, focusing the attention of their fellow students on the main provisions, important points of the issue under consideration. Group members are to write down the most meaningful ideas and main outputs. After studying the material of the entire topic, students individually perform a control test of 20 tasks on the topic (4 tasks for each question). The sum of points scored by group members reflects the result of the work of the whole team.

The result of the lesson is group reflection on the work in the group. The following questions are asked: Is it easy to work in a group? Who felt uncomfortable and why? What helps and what interferes with your overall work? What should be the teacher's help? What new experience have you gained in group work? How can group work be improved?

The students' answers indicate that they like the work to be organized in this way, as they feel more comfortable, there is no fear when answering questions, there is an opportunity to clarify incomprehensible material, but the responsible attitude of all members of the team in preparation for the lesson is necessary, since the result of the group's work depends on each member. [8]

An important structural component of the lesson is the aspect of "unpacking" the technology of work in small groups, aimed at understanding the personal meaning of its application by students. The teacher explains the purpose, tasks, technological aspects of group work, reveals the possibilities of using this technology in the school educational process (as well as in the inclusive education) and answers students' questions.

An obligatory element of practice-oriented education is the development of practical experience, therefore the second stage involves the students' development and modeling lessons in their classroom using the technology of teaching in small groups. The purpose of the activity at this stage is the actualization of students' personal meanings in quasi-profes-

sional activities. The result of students' activities at this stage is reflection and self-analysis of the lesson, accompanied by means of comments and suggestions for improving activities from fellow students and the teacher, each of whom fills in a self-assessment sheet.

The third stage involves the students' development and organization an educational or extracurricular activity using the technology of teaching in small groups in an inclusive classroom in real conditions of a comprehensive school. It can be carried out at a laboratory class the studied course or at pedagogical school practice. This stage is aimed at the implementation of value meanings in professional practice, the student acts as a subject of independent pedagogical activity, a subject of new relationships with children and colleagues. Teachers at this stage are called upon to provide support and assistance to the student in mastering a new position.

Practice-oriented training of a teacher in the process of group work, aimed at the emergence and development of personal meanings of professional activity and based on the actualization of students' own strengths and abilities, ensures the formation of their readiness to solve professional problems in real pedagogical activity.

Another technology that provides practice-oriented teacher training is a pedagogical workshop, which presupposes a developmental space purposefully organized by a teacher, which allows students to come to the construction or discovery of knowledge, and to acquire professional experience in individual, group or a collective search. The position of the teacher in this process is, first of all, the position of an expert, consultant and advisor who helps to organize educational work, to comprehend the progress in mastering the ways of professional activity.

The pedagogical workshop allows:

- to create conditions, situations, educational events for students to form meaning and the a professional and personal position by means of experience in solving professional problems and creative life;
- to ensure the inclusion of participants in the educational process in creative activity of mastering the methods of solving pedagogical problems;
- to organize group and collective activities that ensure active communication and interaction of participants;
- to create conditions for integration with the professional environment.
- to create conditions for mastering competencies in the process of designing and modeling ways of professional activity.

The main principles and rules for organizing a pedagogical workshop are:

1. Value and semantic equality of all participants, including the teacher.
2. Each participant has the right to make mistakes.
3. The absence of marking and criticism of any participant in the workshop.
4. Granting freedom within the accepted rules, which gives a sense of inner freedom.
6. Dialogue as the main principle of interaction, cooperation and co-creation.
7. Organization and restructuring of the real space in which the workshop takes place, depending on the task of each stage.

The main stages of the workshop are: induction, self-construction, socio-construction, socialization, advertising, breaking and reflection. The phased organization of pedagogical workshops allows to consistently deploy the event process, that is, to create a common field of interests and aspirations of the participants in the educational process.

At the induction stage, the most important task is to create an emotional mood for cooperation in the process of dialogical communication, to transfer the freshman from the position of a object, in which he, unfortunately, often stays in the senior grades at school, to the position of a subject. Lectures and practical classes at this stage are aimed at identifying problematic issues of age-related educational science using the technology of developing critical thinking by means of reading and writing. The result of this stage is the formulation of a task for further activities: the creation of a case for jointly formulated problems of the course being studied.

The stage of self-construction involves the individual creation of a hypothesis, which is the search for a solution, an answer to the task. Various options for the structure and content of cases are put forward, which raises many questions to which the teacher must adequately respond.

The stage of socio-construction allows to develop general requirements for the case, which provides 10 tasks of different types for fellow students on the problem under study. The case includes tasks:

- aimed at creating motivation for studying the problem.
- reproductive in their nature, implying the actualization of existing knowledge.
- of creative, productive nature, involving the application of the knowledge gained in new non-standard situations or the creation of new knowledge and products.
- providing the organization of reflection of fellow students on the development of the topic.

The case of tasks worked out in groups of 5-6 people, which are formed in accordance with the wishes and interests of students.

The stages of socialization and advertising involve modeling of the created tasks in the classroom, which creates conditions for mastering professional and pedagogical competencies by Bachelor degree students in action. Here are the examples of assignments simulated by students:

- tasks aimed at creating motivation: "name your associations related to ...", "come up with a mini-poem on the topic ...", etc.
- reproductive nature tasks: "establish a correspondence ...", "answer the question ...", "choose the correct answer ...", "formulate the concept ...", "solve the crossword puzzle ...", etc.
- productive creative nature tasks: "offer a solution to the pedagogical situation", "act out the situation, find a solution to it", "make a cluster ...", "compose a poem, cinquain, a fairy tale ...", "draw as you see ...", "formulate recommendations for parents, teachers" and others.
- tasks for reflection: "The tree of feelings", "Everything is in your hands", "Suitcase, basket, meat grinder", "SMS", etc.

At the stages of breaking and reflection, the experience gained by empirical means is comprehended through the formulation of theoretical propositions, the cause-and-effect relationships are established, and the substantiation of the conclusions are drawn.

The Bachelor degree students' analysis of their own activities made it possible to record the knowledge, skills and personal qualities that they have mastered:

- Studying the course it was possible to learn: "the basics of conducting classes"; "how to build the learning process"; "features of the development of children of different ages, recommendations for education, interesting types of tasks"; "the basics of age related crisis", "peculiarities of interaction with children of different ages";
- The following skills were acquired: "to speak publicly in front of an audience, compose tasks on one's own, work in a team"; "the ability to interest a child, the ability to present information to a child, taking into account his age and individual characteristics, the ability to work in a team"; "work in a team, select material on a specific topic, draw up creative assignments in accordance with the topic"; "the ability to conduct a lesson in a group"; "how to interest the audience"; "the ability to compose tasks for groups".
- The following qualities were manifested: "observation", "creativity" "conscientiousness"; "self-confidence", "the ability to work with people", "the ability to reflect", etc.

The analysis of students' answers lead us to the conclusion that the technology of pedagogical workshops allows solving the following problems:

- creating educational motivation: increasing interest in the learning process and active perception of educational material;
- search and implementation of professional and personal values, relationships and meanings by students and teachers:
- professional and personal self-determination, self-development and self-realization of a student;
- formation of experience in solving professional and pedagogical problems;
- formation of skills of creative comprehension and comprehension of new knowledge, development of creativity. [1]

Thus, practice-oriented technologies allow:

- involving students in a variety of professional activities that help them shape their own experiences.
- stimulating students in professional activity and forming a value attitude towards it.

The implementation of practice-oriented technologies allows organizing not only a common field of interests and aspirations, but also an individual internal dialogue, achieving the involvement of each participant in what is happening in the educational process with, gaining new perspectives on understanding professional knowledge and pedagogical phenomena that ensure the formation of the teacher's professional and personal position.

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ON THE NON-TERMINOLOGICAL CHARACTER OF THE COMBINATION "AUTHOR'S EDITING"

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The validity of the use of the combination "author's editing" in Russian-language scientific and educational materials is considered. With all the assumptions, the logical definition of the named combination does not fit into the terminological field of editing and destroys its fundamental components - editorial analysis and editorial revision. In English-language texts, the combination "author's editing" has a different meaning and is not associated with the improvement of the work by the author himself.

Keywords: editing, types of editing, author's editing, author's correction.

Editing as a complex area of scientific knowledge has developed a terminological apparatus and methodology based on the experience of working with copyrighted materials (manuscripts) over the past seventy years. By the end of the 1980s, in the textbook "Theory and Practice of Editing" by N. M. Sikorsky, a clear separation of the two most important aspects of the editor's work was made: "editorial analysis and practical implementation of his conclusions" [1, p. 179]. Further improvement of the editing terminological apparatus was outlined in the works of Russian and Ukrainian researchers A.I. Milchin, K.M.Nakoryakova, M.D. Feller, M.S. Timoshik, and others in the 1980s - 1990s.

In the hyper-hyponymic paradigm, *editing* is a hyperonym (generic concept) in relation to terminological combinations (hyponyms - species concepts) "general editing", "title editing", "scientific editing", "special editing", "technical editing" and some others. All of them affect a certain part of the editing process, which consists in determining the quality of the proposed informational and spiritual product (i.e., conducting editorial analysis) and, if necessary, adjusting it in the interests of the reader, viewer, listener (i.e.). For example, technical editing focuses on a clear definition of the heading units of a work, their correspondence to the working

content, the choice of fonts and typefaces, the organic inclusion of various types of illustrations in the text, etc. In combination with other types of editing, a mutually complementary set of editorial actions arises that predetermine the best perception works by the consumer. It is clear that the object when performing these actions is the material created not by the editor, but by the author.

Conducting editorial analysis as a complex thought process is based on a deep understanding of the text presented by the author. "First, it is necessary to comprehend what the author wrote (not what he intended to express, but what he actually did, although it is also necessary to understand the author's intention, but this is a subsequent task)" [2, p. 69], - states A. E. Milchin. N. M. Sikorsky also spoke out no less convincingly: "Editorial analysis is a criticism addressed primarily to the author in order to point out primarily to specific shortcomings of labor, to contribute to its improvement" [1, p. 180]. In this case, the editor is a full-fledged representative of the readership, anticipating her understanding of the work and her reaction. It is for this reason that the question arises about the use of the combination "author's editing" (auto-editing, self-editing), which is found in textbooks and tutorials and does not contribute to terminological ordering.

As noted by K.M. Nakoryakova, "auto-editing is an improvement by the author of his finished work, usually in preparation for publication" [3, p. 16]. Let's focus on a comprehensive analysis of this definition.

First, when editing and conducting its first stage - editorial analysis - the editor should do an introductory reading. Does the author really need such a procedure - an introductory reading of his *own* work, on which he has been working, perhaps for years? The definition uses the construction "improvement by the author", indicating possible changes caused by the creative process of the writer or journalist. For example, he decides that the landscape sketch or portrait characteristic he used does not sufficiently reflect the psychological state of the character, and will change the corresponding fragments. As M.M. Bakhtin wrote, "the author not only sees and knows everything that each hero sees and knows individually and all heroes together, but also more than them, and he sees and knows something that is fundamentally inaccessible to them, and in this always definite and stable excess of the author's vision and knowledge in relation to each hero, there are all the moments of completion of the whole - both the heroes and the joint events of their lives, that is, the whole work" [4, p. 44]. Consequently, the author has unlimited opportunities for making changes in his work, reckoning only with his talent. The editor, however,

is devoid of "omniscience", he knows only what he could reveal when familiarizing himself with the work, and cannot change it without the consent of the author. If this happens, then there are boundaries of editorial interference in the author's material, which, however, in Soviet times were destroyed by editors both independently and under pressure from the censorship bodies (Glavlit).

Secondly, according to A. Ya. Esalnek, "writers do not belong to the category of analysts of artistic creativity itself" [5, p. 12], and editors are obliged to be them during editorial analysis as a method of scientific research. The combination "author's editing" could have arisen under the influence of the term *editing* in the meaning of "a variant of some. literary, musical, etc. work or a separate part of it" [6, p. 695]. However, this is also a stage in the creative history of the creator, who, under the influence of various circumstances, has a new edition of the work. It is known, for example, that Leo Tolstoy's novel "Resurrection" has six editions. In this case, the author cannot be the editor of his work, since an outside view is needed, the word of a thoughtful and benevolent adviser. It is the editor who will weigh the degree of relevance of the material, determine the reader's address, focus on the organic composition, etc., which is not always able to be done by the author, who can perceive his work as highly demanded and worthy of publication. "No matter how much one or another author claims that he is able to look at his work from the outside, give it a critical assessment and carry out the necessary correction, this does not correspond to reality" [7, p. 5]. In addition, it is the editor who, even before publication, can determine the place of a work of art among similar ones in his country and on a global scale.

Thirdly, each terminological unit should fit into the general terminological field of a specific scientific field. If we accept "author's editing" as a terminological combination, then we, according to L. I. Petrova, "must agree with such terms as" author's review ", "author's scientific review ", which is completely absurd" [7, p. 4]. In this case, it is impossible to overcome the psychological prerequisites for the perception of one's own text.

T.I. Surikova, arguing that the author also needs "knowledge of the basics of editor (for some reason, not *editorial* - Zh. P. P.) preparation", asserts: it "is useful in **self-editing** - analysis and correction of his own text... The criteria for evaluating variations here are the same as for editing the author's variation. But the process itself has some peculiarities" [8, p. 10]. Further, the author of the textbook gives three features of self-editing: it is difficult for the author to separate information from his text from that known on the topic; the author cannot always take into account the

level of knowledge of the audience; the author is unable to draw the line between the content of the text and the reality reflected in it. It turns out that these "features" almost completely negate the possibility of using the *self-editing* term unit:

In the English-speaking tradition, the distinction between the work of the editor and the author is clearly traced: "Editing is the process of putting the author's writing into a "publishable" form" [9, p. 846]. With all the desire, it is impossible to include the author in this definition once again, for example, "the process of bringing the text into a publicly accessible form by the *author*," since the very form of constructing a logical definition is destroyed. The combination "Author's Editing" only means that editing is done by a specific editor with whom the author enters into an agreement to improve his work. Ergo, we are not talking about editing by the author of his work. For example, let us give a proposal in which we are talking about a freelance editor ("Freelance authors editors also can face the challenge of wearing many hats" [10, p. 21]), who works with the author's work and is forced to solve various problems.

All of the above indicates that the combination "author's editing" cannot be accepted as a terminological unit that must meet the requirements of consistency and unambiguity. Perhaps, in ordinary usage, "author's editing" has the right to exist as a synonym for "the author's corrections of his work after the editor's comments", but this circumstance requires a change and the very combination to "author's correction" as the second stage of the editing process after editorial analysis. However, in scientific (including academic university) discourse that touches upon the problems of editing in publishing houses, various types of media, PR and advertising agencies, management structures and other institutions, the use of the combination "copyright editing" has no grounds.

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PECULIARITIES OF TRANSLATION OF ANTHROPONYMS FROM ENGLISH INTO CHINESE (BASED ON THE FANTASY NOVEL "HARRY POTTER AND THE PHILOSOPHER'S STONE" BY J. K. ROWLING)

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This article gives an insight into the peculiarities of translation from English into Chinese, namely the rendering of proper names or anthroponyms. Proper names of book characters perform the function of an auxiliary stylistic device, they enhance the character, comedy of a situation, or are associated with the personal qualities, social status of those they denote. We managed to detect two most common ways of translation of proper names: transcription and calque translation.

Keywords: Anthroponym, Proper Name, Charactonym, Translation

This article is devoted to the problem of translation of proper names used by J. K. Rowling in the fantasy novel "Harry Potter and the Philosopher's Stone". The Harry Potter novels are associated with fantastic fiction, that is, with the world of unusual ideas and images, born of the imagination and based on real life.

Of particular interest in the semantic structure of fantasy works are anthroponyms, which are a kind of key to uncovering the writer's artistic intention. J. Rowling's work confirms this, so proper names are an integral element of the form of a work of art, one of the means of creating a fantasy world. They have a semantic load and an unusual sound appearance, have a hidden associative background, therefore in translations they must be stylistically correct and accurate, correspond to the idea, the goals of the work, must bring a characteristic flavor, and sometimes a certain special meaning, a special meaning in which the author's idea is expressed. It is for this reason that we set ourselves the task of investigating the

methods of translating proper names from English into Chinese regarding the preservation of the above qualities of a fantasy novel in the texts of its translation.

The study material was J. Rowling's novel "Harry Potter and the Philosopher's Stone" and its translation into Chinese - 哈利 • 波特 与 魔法石 Su Yangzhai.

The relevance of the research topic is due to the need to develop rational translation strategies that are used when translating works in the fantasy genre. Comparative analysis of the original work and the text of its translation into Chinese allows us to identify the lexical and semantic features of anthroponyms and consider the methods of their rendering and preservation during translation.

The anthroponyms of J. K. Rowling's novel can be divided according to onomastic categories: personal names, surnames, nicknames. Personal names are the most numerous. Such nominations are based on the following main features:

- the nature of the character's occupation, profession - Argus Filch ("all eyes" - in Greek mythology, a hundred-eyed monster, whom the jealous Hera, the wife of Zeus, instructed to keep an eye on Io, her husband's new favorite);
- the appearance of the character - the ghost Nearly Headless Nick;
- the character's personality traits, reflection of their inner world - Dudley Dursley ('dud' - "a boring person").

However, in the novel there are many names whose belonging to onomastic vocabulary can be determined only in context. In some cases, they are marked with a capital letter. So, The Sorting Hat in the novel is a magic hat that reads thoughts and, based on this, distributes students to the faculties of the magic school. In most cases, J. K. Rowling's names play the role of an auxiliary stylistic device that is used to enhance the character, comedy of a situation, or are associated with the personal qualities, social status of those they denote.

J. K. Rowling has a deep knowledge of classical mythology, history and language, which she uses to create proper names. In order to preserve the magic in a fantasy novel, the names of the characters must be translated with extreme care. Also, when choosing names, J. K. Rowling selected words that directly indicate the characteristics of the character. For example, in the name of the Minister of Magic Cornelius Fudge, the word "fudge" appeared in the middle of the 18th century with the meaning of disgust or irritation. It began to be used by printers at the end of the same century as the verb "to do poor work". Gradually, it began to be

used more widely with the meaning "to avoid solving the problem", "to evade". This word describes the character well, as the Minister of Magic denied the resurrection of Voldemort. In the name of Professor Sprout, who teaches Herbology, "sprout" means "shoot, sprout", which directly indicates the profession of the character. In the same way, the author created many names with French and Latin prefixes and suffixes, which not only denote the personality of the character, but are also used to create an unusual atmosphere for English readers. As an example, we can take the name Draco Malfoy, in which "Draco" comes from the Latin root "draco", which means "snake", and the surname "Malfoy" in which the French prefix "mal", means "bad". In general, the whole name indicates the depravity of the Malfoy family, whose representatives were the loyal followers of the villain Voldemort.

When translating these names, which carry the traits of the characters, the translator used the transcription method with which Cornelius Fudge was translated as "康奈利 · 福吉", Professor Sprout - "斯普劳特 教授", Draco Malfoy - "德拉科 · 马尔福". The method of transcription when translating these names inevitably led to the loss of the semantic meaning which originally existed in the culture and language of the source. However, the translation indicates a foreign origin of these names, different from the origin of the traditional Chinese name, and this in turn helps to create an atmosphere of magic for the Chinese recipients.

Albus Dumbledore is the greatest magician in the novel, he is the embodiment of justice. The first component of his name, "Albus," is Latin for "white," which defines Dumbledore as a white magician fighting dark magic. The second component "Dumbledore" in Old English means "hornet". J. K. Rowling notes that while writing the novel, she imagined that when Dumbledore muttered, it looked like a bee buzzing. The translation of his name was completely done by the transcription method: "阿不思 · 邓布利多". The translator used "阿不思", which means "mister does not think", where the character "阿" is added to the names in southern China as an indicator of close relationship. In the name Albus Dumbledore, the British could easily guess its meaning, but in the Chinese version 阿不思 · 邓布利多 J. K. Rowling's idea was not conveyed.

The name of another main character "Minerva McGonagall", the dean of the Gryffindor faculty, comes from the name of the goddess in ancient Roman mythology. She was not only the goddess of war and wisdom, but she was also the patroness of artisans and students. Translated into Chinese, her name looks like "米勒 娃 麦格". The hidden meaning intended by J. Rowling was not preserved in the Chinese translation which was

carried out with the help of the transcription method.

The origin and formation of some names are subject to ambiguous interpretations. This, for example, is the case with the name of the professor of potion making Severus Snape. In this case, the name Severus is derived from the English word "severe", or directly from Latin "severus", which has the meaning "strict, harsh, cruel." This word also has a second meaning - "truth". The translation of the Snape surname into Chinese has caused great difficulties. J. K. Rowling said that the name Snape was simply copied from the name of the place, but some interpreters believe that it carries the meaning of reproach or disdain. Some controversy is that this last name can conjure up vaguely unpleasant associations that are most likely associated with words starting with "sn", such as snake, sneer, sneak, snap and so on. Also according to the dictionary of English surnames, Snape is one of the oldest surnames, which was originally written as "Snaep". It was translated into Chinese with the help of the transcription method, which is the generally accepted way of rendering sounds - "西弗勒斯 • 斯内普".

Harry Potter is the main hero in the book. The name "Harry" has several interpretations of its origin, one of which goes back to the German name "Heinrich", derived from the word "heim", which means "home", and the word "ric" - power. "Harry" could also have originated from the name "Harold", in Old English "Hereweald", which means "leader of the army". The surname "Potter" is a common surname in England. Traditionally, this surname is associated with pottery. The name "Harry" was translated by the transcription method, that is, "哈利". The transcription method was also used to translate the surname "波特", and the hieroglyphs mean "wave" + "special".

The name of Harry Potter's friend Hermione Granger, according to one version, is formed from the name "Hermes". Hermes is the Olympian god in Greek mythology, the son of Zeus and the Pleiad Maya, the second of the youngest gods of Olympus. He moves between worlds, easily overcoming their boundaries, he is fast and cunning. Hermes is the protector and patron of travelers, shepherds, thieves, orators, writers and poets and athletes. According to another version, the name also comes from Greek mythology, but on behalf of the daughter of Tsar Menelaus and Helen. In the name of this character, the aristocracy of the personal name is discordant with the surname, which almost literally means "redneck" (grange - farm), and in general causes a comic effect. This name was transcribed as "赫敏 • 格兰杰". The translator chose the hieroglyph "敏" (teachable; resourceful; dexterous; flexible), which not only emphasizes intelligence

and resourcefulness, but also retains the meaning inherent in the original text.

Another technique of the Chinese author during the translation of the book "Harry Potter and the Philosopher's Stone" was calque traslation, which is often used in translating fantasy works. The punny name of the whiny ghost girl Moaning Myrtle has a resemblance to "weeping willow". In addition, in botany, there is a plant called *Eugenia Ventenatii*, or Weeping Myrtle, a genus of evergreen trees and shrubs of the myrtle family. The translator rendered this name as 哭泣的桃金娘, where “哭泣” means “to cry quietly, sob, tearful” and “桃金娘” means “myrtle. In this case, the anaphora of the original name was lost.

As a result of this study, in the novel by J. K. Rowling "Harry Potter and the Philosopher's Stone" we identified 72 anthroponyms, which in 78% of cases were translated using the transcription method, the remaining 22% - with the help of calque translation.

From the point of view of translation studies, the transcription of a proper name has the right to exist, however, when this method of translation is used, part of the semantic load of the lexeme is not conveyed, since hints, allusions and associations that are important for the recipient are lost. In some cases, the translator tried to preserve the semantic load in the choice of this or that hieroglyph for proper names and used the hieroglyphs that can help the Chinese recipient to form the correct idea of the character.

Excessive use of transcription has led to the fact that the translation of the fantasy novel "Harry Potter and the Philosopher's Stone" into Chinese does not meet the criteria of maximum text equivalence, that is, the semantic and functional proximity, equal to artistic expressiveness.

So, the transcription and calque translation of proper names during translation retained the features of the charactonyms in the novel, which evoke the feeling of an atmosphere of magic when reading, but most of the names still lost the hidden meaning intended by the author.

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ÉDUCATION ISLAMIQUE DANS LES PAYS D'ASIE CENTRALE

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Dans le monde contemporain en évolution rapide, un des problèmes les plus importants de la société, en particulier de chaque membre de la société, est la question liée à la définition de l'identité. Au cours de la recherche d'une réponse à cette question posée, il y a un processus d'appel actif à ses racines, à sa culture et à ses traditions. En se remontant aux origines du patrimoine historique et culturel, on relève le plus souvent les valeurs religieuses. S'il s'agit de la région de l'Asie centrale, les valeurs liées à la civilisation islamique et à ses réussites sont certainement au premier rang. Pour maîtriser le patrimoine islamique et la culture islamique, il est nécessaire de moderniser le système éducatif en conformité aux exigences de la science moderne, de l'école supérieure moderne.

Mots-clés: islam, éducation, Asie centrale, traditions, culture.

Avec l'apparition des états souverains nouveaux d'Asie centrale (AC) sur la carte du monde, après l'effondrement de l'URSS, le processus de leur construction de l'état a été lancé, l'élaboration de nouvelles priorités de la politique étrangère et intérieure du pays. Dans la formation des bases dans le domaine spirituel, qui est devenue une des tâches clés des gouvernements et des sociétés d'Asie centrale, la recherche de l'identité nationale est devenue un des points d'appui les plus importants. Pour la résolution des problèmes en priorités et la recherche de l'identité, la société se tourne avant tout vers les valeurs religieuses. «La mondialisation, la transformation des fondements de la vision du monde, l'accélération rapide du temps historique conduisent à la nécessité de réévaluer la place de la foi

et des valeurs religieuses.»¹ - a souligné le président kazakh Kassym-Jomart Tokayev.

Souvent, la notion même de «facteur islamique» a un sens plus étroit, ne mentionnant que l'aspect politique². Cependant, il faut prêter attention au moment aussi important qui existe dans l'islam et le distingue des autres religions monothéistes, y compris aussi, le christianisme. Et en quoi il consiste?

Tout d'abord, il s'agit d'une caractéristique de l'islam comme l'orientation de la doctrine islamique, afin de rationaliser et d'éclairer les données de la vie, visant à réguler la moralité humaine. C'est-à-dire que l'islam n'oppose pas l'homme, sa nature humaine aux certains autres valeurs suprêmes. Il en résulte que l'islam, contrairement aux autres religions mondiales, est proche à la vie terrestre et réelle. Il est important de noter le fait que l'islam n'ignore pas la vie courante et la vie de tous les jours de l'homme (comme quelque chose secondaire), et il aide l'homme à trouver son chemin vers l'harmonie par l'aspiration de conduire à l'ordre par les principes moraux.

Il en suite de celui ci-dessus, que l'islam est devenu non seulement une religion pour les musulmans, mais une façon de vie. En prêtant l'attention aux normes éthiques, il est à noter que les croyants ne perçoivent pas les fondements de la loi islamique comme quelque chose intrusive, mais comme ce qui permet à une personne de grandir au travers de la capacité d'une personne réelle, de sa compréhension et de sa perception. Ces normes sont des principes invariants, on peut dire les règles universelles de la façon dont l'homme peut construire sa vie. La caractéristique principale est ce que le respect des normes ne dépend pas de l'environnement et du lieu de résidence du musulman. Tout cela semble être un signe très significatif, en tenant compte que le monde est actuellement au cours des changements qui affectent les composantes géopolitiques et historiques et culturelles de la population mondiale. Nous attirons l'attention sur le fait que l'islam conserve ses fonctions dans les espaces différents, c'est-à-dire dans les territoires différents et aux moments différents, tout d'abord, en appelant aux aspects moraux de la nature humaine, en opérant, en premier lieu, les valeurs morales. L'oumma musulmane vit selon certaines règles de la vie collective. Parmi les défis complexes de l'islamologie aujourd'hui, le problème de l'analyse

¹"Nous voulons avoir l'islam éclairé". Tokaev s'est adressé aux scientifiques musulmans https://tengrinews.kz/kazakhstan_news/myi-hotim-imet-prosveschennyiy-islam-tokaev-obratilsya-338950/

²Malachenko A. L'islam et politique dans les états de l'Asie centrale // L'Asie centrale et Caucase. - 1999.-№4(8).p.59.

philosophique reste: l'islam comme une forme de la conscience sociale (raison), en s'appuyant sur le potentiel humaniste et éducatif. L'orientaliste de l'Europe Occidentale, F. Schuon, a noté: «Le livre d'Allah nous a été donné comme un «discernement» (furqan) et un «avertissement» (dhikr) à la «lumière» (nur) qui illumine le crépuscule de notre conscience terrestre»³.

La solution des questions nombreuses et problèmes existants dépend certainement du niveau et de la structure et, en général, de la structure et du fonctionnement du système d'éducation religieuse, en particulier celle islamique dans tel ou tel pays, ainsi que de leur interaction avec les institutions islamiques internationales.

Au début du XXe siècle, la région de l'Asie centrale le processus de l'adaptation de la société aux nouvelles conditions de vie apparues après le coup d'état d'octobre. Il est à noter que le mouvement réformateur avec des idées islamiques a été posé beaucoup plus tôt, ce qui a finalement conduit à l'activation dans les lumières et l'émergence des idées du jadidisme. La question de la modernisation du système éducatif islamique est apparu. Les États d'Asie Centrale étaient en retard dans le processus de modernisation de l'éducation religieuse, par exemple, même l'émirat de Boukhara, considéré comme le centre de l'éducation islamique dans la région, de l'Iran voisin, où une «école de méthode nouvelle» est apparue en 1852 et le ministère de l'éducation est apparu en 1855. Bien que, par souci d'équité, il faut noter que les États d'Asie Centrale ont compris la nécessité de réformer le système d'éducation religieuse. L'arrivée du pouvoir soviétique dans la région a entraîné des changements fondamentaux, tout d'abord en isolant la région de l'Asie centrale du monde islamique. Comme vous le savez, les soviéts ont séparé la religion de l'état et apporté un autre facteur important que l'éducation est devenue une partie intégrante de l'idéologie soviétique, ce qui a finalement complètement changé le contenu même de l'éducation. Au fil du temps ces changements ont conduit à la perte des traditions séculaires et à l'effondrement de l'école scientifique et intellectuelle, y compris la plus célèbre dans la région de AC, à Boukhara. Pendant les années de l'athéisme militant, la littérature religieuse a été détruite, des mesures répressives ont été appliquées aux personnalités religieuses. Pourtant, en 1943, il y avait des mesures prises par le gouvernement de l'URSS, où il s'agissait de concessions concernant la religion⁴.

³F. Schuon. Comprendre l'islam.// Question philosophiques.1994.№7-8.p.134

⁴Troukhine V.N. Ascension religieuse dans l'Union soviétique pendant la Grande guerre patriotique. Matériaux électroniques UEM <http://www.hist.msu.ru/Science/Conf/lomweb01/truhin.htm>

Après la fin de la Grande guerre patriotique, il y avait un événement important dans l'histoire de l'éducation religieuse en 1947, la médersa Mir Arab a été ouverte à Boukhara⁵.

Beaucoup plus tard, à Tachkent, en 1980, l'institut islamique nommé d'après l'imam Bukhari a été ouvert. Dans ces deux établissements, des représentants de toute l'Union soviétique ont reçu une formation professionnelle. «Ces deux établissements d'enseignement ont fort contribué à la formation du personnel du clergé musulman et ont poursuivi leurs activités après l'effondrement de l'URSS.»⁶

Bien que dans les années 60s, les dirigeants de l'URSS aient continué à mettre en pratique l'athéisme, malgré cela, les années de dégel de Khrouchtchev sont généralement considérées comme une période de «répit», c'est-à-dire un certain assouplissement du climat politique dans le pays. Ici, tout d'abord, il faut dire qu'il y avait un retour de personnes célèbres qui se trouvaient dans les camps staliniens. La figure clé qui a contribué à la Renaissance de l'éducation religieuse en Asie centrale était Mukhamjon Roustamov (Mawlawi Hindoustoni)⁷.

Mais, finalement, des mesures répressives ont été prises, ce qui a conduit les détenteurs restants de connaissances religieuses à se réfugier dans la clandestinité.

Dans les années 1990-caractérisé par l'intensification des organisations islamiques et des directions de sens différents dans les pays de la Communauté d'États Indépendants et la région de l'Asie centrale que nous considérons n'était pas une exception non plus. Dans cinq républiques de la région, la situation était complètement différente. Le Kirghizistan, l'Ouzbékistan et le Tadjikistan étaient les plus vulnérables. L'Ouzbékistan et le Kirghizistan ont également connu des interventions multiples des militants et des attaques terroristes. Sur le territoire desquelles des révolutions de couleur et des terracts se passaient. Le Tadjikistan est devenu un état où la formation d'un nouvel état était très difficile et s'est manifestée dans une confrontation ouverte, qui s'est transformée à une longue guerre civile. L'opposition extrême du parti islamique et du gouvernement (entre l'opposition nationale islamique et de la nomenclature soviétique) était une guerre civile au Tadjikistan, qui se passaient en 1992-1997. Les partis op-

⁵Médersa monde arabe est devenu le centre de l'éducation musulmane en URSS

⁶Akhmadoullin V.A. Particularités de la formation soviétique à deux niveaux du personnel islamique: expérience et leçons-l'islam dans le monde contemporain: aspects politiques nationaux et internationaux. M.: ID "Medina" T.11 №2, p.155.

⁷Les lideurs musulmans: rôle social et autorité. Douchanbé. Centre Chark. 2003. P.94.

positionnistes⁸ représentés par le Parti de la renaissance islamique et le mouvement⁹ «Rastokhez»-«Renaissance» ont opposé une résistance aux troupes gouvernementales et en 1996 le talibans les soutenaient.

Depuis les années 90s, le terme «wahhabites»¹⁰ étaient activement utilisé dans les publications scientifiques et plus souvent dans les mass médias. Avec l'indépendance, lorsque toutes les interdictions et tous les obstacles ont été enlevés, le nombre des croyants a immédiatement et significativement augmenté, il faut noter ça pour toutes les confessions religieuses principales, il ne s'agit pas seulement de l'islam, mais aussi du christianisme et du judaïsme. Les adeptes du protestantisme et des autres mouvements et sectes inconnus jusqu'au moment dans la région de l'Asie centrale sont apparus.

C'est ce qui explique l'intérêt qu'on constate aujourd'hui pour ce sujet, tant de la part des politiciens, des théologiens et des experts, ainsi que de la part de la société. En examinant les aspects différents du soufisme, il est également important de noter le moment, que les scientifiques pretent attention à ce qu'il contient des idées importantes pour la modernité liées à la résistance au mal et à la violence, à la guerre et au radicalisme, à la capacité de défendre la justice, d'établir l'amitié entre les personnes et les peuples. Un autre facteur influençant l'actualité de l'étude de ce sujet est ce que des idées nombreuses universelles, pédagogiques et éthiques des soufis ont accumulé un potentiel humaniste précieux qui pourrait jouer un rôle positif dans la formation des normes spirituelles et morales de la société contemporaine, c'est-à-dire tout ce qui manque évidemment à notre société.

La diffusion de l'islam en Asie centrale avait lieu au début du VIII^e siècle et il s'est renforcé dans la région au IX^e siècle avec la formation de l'état Samanide. Le fondateur de cette dynastie, Saman Khoda, devient musulman en adoptant l'islam du gouverneur arabe de Khorassan à Merv, et ses petits-enfants étant musulmans sont devenus les gouverneurs des grandes villes d'Asie centrale, y compris Samarkand, Fergana, etc¹¹. Il s'agit des territoires de trois pays modernes d'Asie centrale: le Tadjikistan, l'Ouzbékistan et le Turkménistan. Le nom du cheikh soufi Ahmed Yasa-

⁸Dans un nombre des oppositionnistes il y avait ceux qui ont été formés en Afghanistan, dans la province de Tahor.

⁹Selon le leader Khodji Akbar Touradjonzoda pour déclarer l'état islamique, les scientifiques islamiques, les médecins, les ingénieurs, etc. sont nécessaires. La volonté de la population de percevoir les valeurs islamiques.

¹⁰Comme ce terme était compris au début des années 90s en URSS, et puis dans la période entre deux guerres tchéchènes, divers concepts ont été compris.

¹¹Kamoliddine Ch. Samanides. Des l'histoire de l'état d'Ouzbékistan IX-X siècles, 2012. Saabruken, p. 45

vi est associé à l'islamisation du monde nomade de l'Asie centrale, cela concerne les kazakhs et les kirghizes. "...L'islam est devenu une forme constante de religion, et les communautés musulmanes ont développé leur propre système éducatif, qui a non seulement assuré l'enseignement de la religion, mais a également maintenu un niveau relativement élevé d'alphabétisation parmi les peuples musulmans jusqu'à la fin du X¹^e.»¹²

Parmi les pays de la région de l'Asie centrale, dans la république Kazakhstan la Loi «Sur la liberté de religion et les associations religieuses»¹³ a été adoptée en 1992 et, d'après ces experts, elle est conforme à toutes les normes internationales et aux règles généralement acceptées.

Ainsi, la politique qui a proclamé la renaissance de la nation «kazakhe» a conduit à une révision du rôle et de la place de l'islam et de ses courants dans la vie de la société. Depuis 2003, la République du Kazakhstan organise des congrès des religions du monde, avec la participation dans lesquels des représentants de confessions différentes de l'islam, du judaïsme, du christianisme, du bouddhisme, du shintoïsme, du taoïsme et de l'hindouisme, ainsi que des représentants de grandes organisations internationales sont invités pour le travail dans le haut forum. Le Concept actuel de développement de l'éducation religieuse 2017-2020 dans la République du Kazakhstan, adopté le 20 juin 2017 un des objectifs principaux de ce document est de protéger les jeunes de l'extrémisme religieux et des courants radicaux et du terrorisme. L'éducation des jeunes dans un esprit de paix et d'égalité de traitement à l'égard de toutes les nationalités vivant sur le territoire du Kazakhstan.

Il y a 2550 mosquées dans le pays, et environ 11 millions de musulmans, qui représentent 24 nationalités, il y a environ deux douzaines de médersa, trois universités dans les villes Chimkent, au Turkestan et à Almaty où les ministres du clergé et les spécialistes des religions sont formés. Il y a ses propres éditions. Depuis 1977, la direction Spirituelle des Musulmans du Kazakhstan publie un magazine mensuel intitulé «Le monde de l'islam». Les efforts de la République du Kazakhstan pour l'interaction internationale des pays musulmans dans la préservation de la paix et de la concorde ont été appréciés et, en 2013, la République du Kazakhstan a été honorée de présider l'Organisation de la Coopération islamique. La participation active de la République du Kazakhstan dans telles structures que l'Organisation

¹²Mourtazin M.O. Sur le système d'éducation islamique dans l'espace musulman post-soviétique. https://www.imemo.ru/files/File/magazines/rossia_i_novay/2019_02/12-Mourtazin.pdf

¹³Loi de la république Kazakhstan № 1128-XII du 15 janvier 1992 «Sur la liberté de religion et les associations religieuses» https://online.zakon.kz/Document/?doc_id=1000934

de coopération islamique (OCI) détermine la nature des mesures mises en œuvre par l'état et donne lieu aux projets d'infrastructure. Souvent, utilisé comme une «marque» et un élément formant système dans telle coopération, les personnalités de l'histoire de l'islam commune pour les musulmans sont également utilisées. «La place la plus importante dans le développement spirituel de l'islam est occupée par les idées ascétiques, mystiques et panthéistes apparues sur sa base, combinées dans la doctrine du soufisme.»¹⁴ Associé à la construction d'une «identité nationale», cela explique l'intérêt pour le soufisme et son histoire, particulièrement caractéristique pour le Kazakhstan moderne. Cette dynamique a entraîné une tendance à la recherche de l'héritage spirituel par l'orientalisme à la fois directement kazakhe et étrangers, dans lequel les soufis jouaient le rôle important, et parmi eux, la figure du fondateur des yesevi-tariqas Khoja Ahmed Yasavi occupe une place particulière. Ainsi, l'étude du yesevi tariqat¹⁵, aujourd'hui acquiert une signification appliquée.

«Les institutions d'éducation religieuse ont toujours eu un impact décisif sur la formation de la pensée religieuse, des sectes religieuses et la diffusion des mouvements religieux, y compris les mouvements réformateurs et les écoles dans l'islam...»¹⁶.

Le discours du premier président de l'Ouzbékistan I. A. Karimov attire l'attention, en particulier, dans le livre «L'Ouzbékistan sur le seuil de XXIe siècle: menaces à la sécurité, les conditions et garanties de progrès», il souligne: «Nous sommes pour que la religion continue à jouer le rôle de familiarisateur de la population aux valeurs les plus haute spirituelles et morale, au patrimoine historiques et culturel»¹⁷.

Un rappel de l'apogée de l'éducation islamique dans la région d'Asie centrale est un certain nombre de complexes magnifiques et parmi eux, il faut noter, tout d'abord, l'ensemble Régistan, situé dans la capitale Timouride dans la ville Samarkand. Le complexe comprend: la médersa Ulugh Beg (1417-1420), Cher-Dor(1619-1636), Tilya-Kori (1646-1647).

Dans les années 90s, des jeunes d'Asie centrale sont allés à étudier dans des établissements d'enseignement à l'étranger. Dans la liste des pays trois états étaient les plus populaire ce sont la Turquie, le Pakistan, l'Arabie Saoudite, et plus loin dans cette liste, l'Iran, l'Egypte, l'Indonésie, la Malaisie et d'autres. Un des facteurs déterminants de ce choix est devenu

¹⁴Voir: Histoire de la Philosophie orientale. Ed. M.T. Stepanyants M., 1998.

¹⁵Dans un sens spécifique, il est compris comme "fraternité, société, organisation".

¹⁶Rahnamo A. Kh. Éducation religieuse et formation de la pensée religieuse <http://www.islam.sng.com/tjk/culture/3255>

¹⁷Karimov I.A. L'Ouzbékistan au seuil du XXI siècle: menaces à la sécurité et conditions et garanties du progrès. Tachkent, 1998. P. 28.

ce que beaucoup de pays ont fourni aux étudiants des bourses d'études et beaucoup de jeunes gens, qui ont connu des difficultés financières ont exprimé le désir d'aller étudier dans les établissements de l'enseignement islamique de ces pays.

Pas tous ceux qui ont reçu une éducation islamique à l'étranger passent avec succès le processus de réintégration dans leur société, ce qui est lié au fait qu'un certain nombre des diplômés apportent des connaissances complètement différentes, c'est-à-dire une version étrangère de l'islam dans leur pays.

Les ministres spirituels locaux ne peuvent pas parfois résister aux diplômés étrangers, car ils manquent parfois des connaissances en arabe et de connaissances scientifiques.

Il y a un autre problème qui est lié à la recherche d'un emploi par des religieux diplômés et des théologiens islamiques. Dans les pays d'Asie centrale, pas tous les ministères reconnaissent les diplômes obtenus à l'étranger. Parfois, ceux qui ont reçu une éducation dans leur pays d'origine, bien qu'ils aient étudié dans des universités privées, connaissent mieux la partie cérémonielle de la religion et ont plus de pratique. Ainsi, ils connaissent mieux l'environnement local, la société locale. En outre, il faut noter que "rester dans l'environnement" implique également l'assimilation des croyances religieuses, des normes et des principes dans les procédures éducatives, éducatives...»¹⁸.

À travers la conscience religieuse, il y a une influence significative de la conscience sociale dans son ensemble. Par conséquent, la réforme et la modernisation de l'enseignement religieux doivent tenir compte du niveau de développement de la société moderne, ce qui contribue finalement au développement stable de l'état.

En examinant les problèmes liés aux particularités de l'éducation islamique dans les pays d'Asie centrale, il faut noter que la tâche de revitaliser le système d'éducation religieuse est complexe et multiforme, car les traditions séculaires et la continuité historique du développement de la culture islamique dans la région ont été perturbées.

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GLOBALIZATION AND GENDER EQUALITY IN THE MODERN WORLD

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The article analyzes the demographic and gender consequences of globalization and the transformation of the international labor market. The study showed that the struggle for gender equality and equal access to progress for women and men has led to serious gender disparities and risks in the position of both women and men. The aggravated problems of gender segregation of labor, feminization of the market and male unemployment, decrease in fertility and reproductive opportunities, reduction of marriage and fertility, today are serious challenges to the demographic security of many countries of the world.

Keywords: demographic security, gender equality, feminization of the labor market, unemployment.

Globalization carries its risks for the social structure of society and leads to radical transformations in public institutions. The main risks that we identified when analyzing the problem of gender equality in the context of the modern transformation of the labor market can be summarized as follows:

1. The general trend that accompanies the modern process of globalization is the massive increase in women in the labor market, this process can be observed especially noticeably in the countries of the Asia-Pacific region, African and Latin American continents, but it is no less intensive in other regions of the world. However, this not only did not lead to equality in the labor market between men and women, but caused a number of consequences:

- from the process of feminization of labor, first of all, TNCs benefited, which, actively promoting the right of women from developing countries to work, pulled the female labor market over to themselves, ensured a reduction in labor costs and social guarantees. Women are becoming a cheap, low-paid and ever-expanding resource of globalization, the marginalization of female labor and the filling of the “most unstable segments” of the market by women. It can be said that cheap women's labor has become the main driving force behind globalization and industrialization, due to the fact that the female labor force has turned out to be more attractive to employers due to its low cost, high dedication, and discipline [Rimashevskaya 2002: 27];

- as a consequence of the massive involvement of women in the economic and political process, there was a natural increase in competition between men and women for jobs, as a result, women began to oust men from working niches, and unemployment among the male population increased. For example, an increase in the share of women in the labor market in European countries has led to fierce competition for jobs with men and a reduction in male employment in Europe, and lower wages on the part of employers. Germany, Belgium, USA faced this problem. A large proportion of young Europeans faced unemployment, their share in European countries in 2018 was 16.1% (Greece - 39.9%, Spain - 34.3%, Italy - 32.2%, Croatia - 23.7% France - 20.8%, Portugal - 20.3% [Eurostat. Unemployment 2018];

- female employment and male unemployment have an impact on the number of marriages and fertility. Many young couples postpone the process of making seven and having children until later. Male unemployment has a rebound effect for married women who have children but are forced to look for work to support family income in the event of husband's unemployment or low wages. The consequences of such a demographic strategy in Europe, with the reduction of the indigenous population, migration replacement, abortion, high mortality, may be irreversible;

- the problem of male unemployment today has far-reaching demographic and social consequences associated not only with the loss of the breadwinner, but also with the gender frustration of men, the loss of life priorities. Today, many men in European countries work part-time, so in the Netherlands this figure is 13.4%, it is unemployment and the inability to find a stable income that European men and women cite as the main reason for refusing to create a family and have children. In addition, there is an exclusion of older men and women from the labor market (55-64

years). In Europe and North America, this decline was more pronounced than in other regions, but almost universally there was a similar decline for this age group in other regions [Scientific report 2012];

- the feminization of labor leads to overloads of women, men and younger children in the reproductive sphere associated with the birth and upbringing of children. The current situation leads to even greater oppression of men and women, in addition to the fact that a woman is forced to work, she still bears a reproductive burden, often unpaid. Men also bear the reproductive burden of financial responsibility for family and children, elderly parents and relatives, but in modern conditions, faced with the problem of unemployment and the inability to find a well-paid job, many decide to refuse to create a family;

- the problem of encouraging female domestic work remains unresolved. Neoliberals believe that an economic approach is possible here too, it is enough for a woman to simply pay for reproductive functions and housework. Representatives of this approach call the process of the birth and upbringing of children "the production of products and services necessary for the reproduction of the human race", they see in the traditions of providing men with families the fact of patriarchal dominance over the reproductive function of women. Radical feminists point out that women receive nothing for reproductive efforts, childbirth work, childcare, cooking, cleaning, and home interior design. They also note the fact that it is the woman who bears the main burden of family planning, taking dangerous hormonal drugs and risking her health and the health of future children. At the same time, the mass employment of women leads to a drop in the level of health of women and their family members, the success and socialization of children at school.

Despite the increase in female labor, the share of women in global ownership is still insignificant, and the market for high technologies and business services is almost entirely the prerogative of men. Feminists believe that it is necessary to go even further and ensure equal representation in the political sphere, so that women have the opportunity to participate in decision-making and fight for their rights. But as practice shows in countries where the share of women in politics is about 30%, and these figures are achieved by strict regulation and anti-discrimination norms (Germany, Denmark, the Netherlands, Sweden, Norway, Finland, Iceland), women still do not have a significant impact on decision-making in the field of economics, are very insignificantly represented as heads of enterprises, they are not among the heads of transnational corporations [Waerness 2001].

Women still do not have equal access to technological progress compared to men (only 30% of women are employed in research, even less in engineering and mathematics, less than 25% of IT professional positions, use the Internet 50% less than men) The largest gap is observed in developing countries, already now neoliberals say that these countries most likely will not be able to fully participate in the technological revolution [Schwab 2016].

The implementation of globalization programs ("structural restructuring of the economy") has led to a sharp reduction in social services for the population, primarily women. By reducing spending on social programs on the part of the state, conditions were provided for concessional lending, tax relief, and a decrease in customs and fiscal fees for business reform and liberalization. According to research by economists, the reforms were successful, they had a positive effect on business activity, including women. But since taxes and fees are one of the most profitable items of the state budget, the state spending on financing social programs was sharply reduced, the staff of civil servants and budget workers was reduced, where women make up the bulk of workers, which is why women become the most vulnerable part of the population in terms of taxes and concessional lending. This also affected the reduction of government spending in public health, education, and social security. The loss of state control over social policy and the actual retreat before TNCs, foreign exchange funds, international financial organizations, SPAs, philanthropists led to a partial loss of the state's economic sovereignty. According to S.M. Menshikov, "such a TNC policy leads to an extremely uneven distribution of income and wealth, gives advantages to some social strata and, on the contrary, punishes others." Monetary instruments are also not gender neutral, for example, an increase in the refinancing rate leads to an increase in unemployment. There are more and more pessimists among gender experts, there is a growing conviction that the globalization of the economy without the corresponding transnationalization of labor, social, environmental and political rights will become the path to a global catastrophe, when, with the reduction of state sovereignty, the world financial elites and capital will take over [Ballaeva 2002: 35- 85].

Thus, the analysis showed that the massive increase in women in the labor market not only did not lead to equality between men and women, on the contrary, women turned into a low-paid and increasingly expanding resource of globalization, further marginalization of female labor is taking place and women are filling "the most unstable segments »The market. The massive involvement of women in the economic and political process

is the main reason for male unemployment and the displacement of men and older people from the labor market, which in turn affects such demographic indicators as life expectancy, frequency of marriage and fertility. The feminization of labor leads to overloading of women, men and young children in the family, associated with the birth and assistance in raising children, the mass employment of women leads to a drop in the level of health of family members, success and socialization of children at school. The problem of unequal distribution of benefits between men and women has only worsened, women still do not have a significant influence on decision-making in the economy, very little are represented as heads of enterprises and TNCs. Segregation of labor persists; women do not have equal access to technological progress as compared to men. We especially note the negative nature of the gender programs being implemented in the field of women's education, which form new reproductive attitudes in women, aiming them at career and self-realization, teaching girls early "family planning" through contraception and "safe abortion". Programs of this kind will invariably lead to a reduction in the birth rate and the formation of patterns of life that are not related to the birth and upbringing of children.

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SANOGENIC REFLECTION AS A FACTOR OF GETTING THE MEANING OF LIFE. STATEMENT OF THE PROBLEM

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The article is devoted to the issue of finding the meaning of life in a psychotherapeutic way, psychological recovery through understanding what is happening, the development of sanogenic thinking as a possible way to gain meaning.

Keywords: finding the meaning of life, sanogenic thinking, sanogenic reflection.

- I'm fine, but in my heart, I'm suffering ...
- I don't know what I want, I don't know what to do, nothing pleases me ...
- I'm not sure of myself, I really depend on the opinions of others, I'm tired of conforming, I just want to live ...
- I am very afraid of losing loved ones, life without them has no meaning for me ...
- My life is "Groundhog Day", it is empty and meaningless ...

These are common requests for psychological work.

The topic of the loss of the meaning of life and the associated inner emptiness is very common now. What determines the relevance of the topic of our work.

The object of our research: finding the meaning of life.

Subject of research: sanogenic thinking as a factor in acquiring the meaning of life.

Sanogenic thinking has not yet been considered in this vein, which is the novelty of the work.

In this paper, we will consider some approaches to understanding the meaning of domestic and foreign authors. Let's highlight the problem of

loss of meaning. Here are the main steps of psychotherapeutic work in the direction of finding the meaning of life using the example of logotherapy. And we will consider the concepts of sanogenic thinking and sanogenic reflection, the method of developing sanogenic thinking as an improvement and addition to psychotherapeutic work to acquire the meaning of life.

As psychological approaches to the consideration of the concept of the meaning of life, we took the approaches of the following authors: A. N. Leontiev, B. A. Sosnovsky, A. Langle and V. Frankl.

A.N. Leontiev considers the meaning mainly in the context of the theory of activity as one of the functions of motive along with the direction and motivation for activity.

However, he also distinguished three types of meaning: biological (instinctive), vital, conscious (reasonable, personal, subjective). But the broad consideration included the understanding of meaning, which refers to action and is formed in the relationship between motive and goal as its meaning-forming function.

B.A. Sosnovsky noted that the formation of meaning is not only the decisive function of the motive, but carries an extremely rich activity and personal content.

Emotions are included in the network of meaningful relationships. Meaning formation is carried out not by the motive, but by the person.

The meaning answers the question: "For what? In the name of what? " Which includes an emotional attitude to everything that happens.

The meaning can be psychologically decisive and in its own way participate in the choice of motives. The semantic orientation also exists in inactive, but psychologically significant manifestations: emotional, mnemonic.

That is, the meaning is also derived for the structure of activity and is directly related to the structure of the personality, to its general orientation.

Alfried Langle, in continuation of the teachings of Viktor Frankl, makes the concept of meaning behind the structure of the personality in general, noting at the same time an important direct interaction with its value environment. That is, it is very important for a person to find the value of a given moment outside and thereby gain a sense of meaning within himself.

If this does not happen for a long time, a person develops an internal emptiness, he experiences protracted negative emotional states about this, or tries to fill this emptiness with imaginary spontaneous values, which gives a short-term effect and further aggravates the situation, since

the feelings experienced are drowned out, simply- they are simply held, and a lot of vitality is spent on this hold. Here we are just observing the mechanism of protective reflection from negative experiences.

Logotherapy as a means of assisting in finding the meaning of life in the key of our topic seems to us the most interesting of all approaches to the problem of meaning.

Logotherapy marks three steps in finding meaning in life

Step 1. Changing the angle of view - shifting attention from your own suffering to the situation in which you find yourself. Consider its features. Describe it without emotion. What is my life now.

Step 2. The search for personal value in a situation: what is responding to me in this situation? What are you pulling for? What area do I need? A. Langle says that for each person in the current circumstances there is a value, there is a task that needs to be solved by him. When he finds it, he feels meaningful.

Here, at the level of feelings, a person opens up to the possibilities of the situation and correlates them with his own inner values. An inner instinct (intuitively) determines the direction for further movement. As if at this moment there is something that is in store for him. "In order to perceive the meaning, a person does not need any of the five senses, because the sense organ is an inner sense of what is right. Strictly speaking, this instinct can be called conscience "- V. Frankl.

Step 3. Determination of future value. Where should I come? What am I here for? What can be good in the future thanks to me? This third step can be quite small: do something, call someone, find out something, read something, start a business, decide on something. If this step is taken with internal consent, it will not be wrong, it will lead to the next step.

I would like to highlight several theses of logotherapy related to the process of comprehending life:

- "Anyone who has a reason to live will endure almost any how"

"The meaning does not mean the general significance of life — it is not comprehensible, but participation in the formation of circumstances. A person's life turns out to be meaningful when in every moment he is present entirely - with all his skills and inclinations, feelings and will, makes a choice and makes the only right decision for himself. "

- "We are capable of a deep meeting when we live in the consciousness of the uniqueness, exceptionality, exclusivity of every moment. When we dare to think: what would I do or say now if I knew that this meeting was the last? ... And maybe now I can do something that later will be too late

to do? Our life is more meaningful if from the very beginning it is accepted and until the very end its finale is not lost sight of."

- "Meaning is the possibilities we read between the lines of reality. This is what invites, captures, surprises and delights us. Something that fascinates me when I look at the mountains in the light of the sunset or study cell tissue under a microscope."

Logotherapy marks an important point in finding meaning here and now - this is feeling, flair, intuition (conscience). A person should not so much analyze as feel what is significant for him in this moment.

The problematic is that because of the feeling of guilt formed in childhood, the desire to meet the expectations of others, to receive their recognition and approval - to receive love from the outside, the love of which is lacking inside - a person does not do what he wants. And what, in his opinion, will be approved and recognized by others.

The reason for this lies in childhood, when the act is identified with the personality of the child. "You are bad because you did wrong." Since you're bad, you don't get my attention and love. Only the good deserve them. In this situation, the immediate unconditional love of the parent is not felt, love is not for good behavior, but for the fact that you simply are. But it is this love that later develops into a stable feeling of self-worth, love for oneself, acceptance of oneself as it is.

Without self-acceptance, a person is not free and unhappy. He forgets himself, his true desires, loses his meaning and does not live, but there is something that gives him a lot of suffering. He himself makes a choice in favor of his own lack of freedom due to a lack of self-acceptance, a lack of inner support for loving himself for who he is. Ask him what he is feeling now - pain, guilt, resentment, loss, fear, despair, emptiness. Can tell what he thinks, what are the options, arguments "for" and "against" and usually there are infinitely equal numbers of them.

In order to develop flair, intuition, the importance of which is noted by Langele, in order to determine what is "yours" and what is "not", it is necessary first of all to remove this negative emotional layer, to work in terms of attitude towards oneself, self-confidence, self-acceptance. Learn to feel. Learn sanogenic reflection and sanogenic thinking.

The concept of "Sanogenic thinking" was proposed by Yu.M. Orlov. It, unlike pathogenic thinking, gives a person the opportunity to think constructively, increases the objectivity of perception and analysis of the situation, which reduces the duration and strength of experiencing negative feelings, such as fear, resentment, guilt, etc. Sanogenic thinking is

the habit of thinking correctly, bringing your emotional state to a state of rest, which leads to psychological and physical recovery of a person. The concept of "Sanogenic reflection" was introduced by S.N. Morozyuk and defines the thought process of analyzing feelings and thoughts that caused them.

In our opinion, work towards acquiring the meaning of life will be more effective if you connect work with an emotional state and self-acceptance.

The method of developing sanogenic thinking makes it possible not only to work out your emotions and the reasons for their occurrence, to understand your feelings and the current situation, but also to get yourself out of a difficult state, makes it possible to independently provide yourself with help and support in gaining meaning.

Developing sensitivity through working towards self-acceptance and self-confidence will help a person see and feel the meaning of each moment, choose their task and gain meaning. Live a meaningful life.

In the continuation of research in the field of finding the meaning of life, we see the creation and implementation of experimental work using the method of developing sanogenic thinking.

We assume that this method will help to work out emotional experiences in a qualitative way, increase the sense of self-worth, and, most importantly, will allow a person to independently move along the path of acquiring the meaning of life. And ultimately find happiness to be yourself.

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CAUSES AND CONDITIONS FOR THE EMERGENCE OF INTERPERSONAL CONFLICTS

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In this article, the objective and subjective causes of interpersonal conflicts in various fields of life are described. The characteristic features of the process of interpersonal communication and the main models of personality behaviour in a conflict situation are identified and described. The idea is substantiated that the analysis of conflicts, causes and characteristics of their emergence helps to successfully resolve issues of forecasting and prevention of conflict situations.

Keywords: conflict, interpersonal communication, psychological incompatibility, behavior patterns

Introduction

Interpersonal conflict is a clash of individuals in the process of their interaction. Such clashes can occur in a wide variety of spheres and areas of life (economic, political, sociocultural, etc.) and have different scales of mutual claims: from a place in public transport to a managerial chair in an institution; from a piece of bread to a multi-million state. In any interpersonal conflict, there are at least two participants and a certain specific situation in which the initial incident occurs and its consequences develop.

The subjects of interpersonal conflict are individuals protecting their personal or group interests. The object of conflict is incompatible needs, interests, values, positions, goals, etc. of interacting individuals. The exception is unrealistic (objectless) interpersonal conflicts in which the cause of the confrontation is the mental state of one, two or more subjects. In such a conflict, an incident is usually passed as the cause (object) of the conflict.

In an interpersonal conflict, it is not interests and desires that clash, but real individuals in regard to incompatible interests and desires. The clash of desires, aspirations, etc. is peculiar only within the intrapersonal conflict. Interpersonal conflict also suggests a real confrontation between the parties, and not only “mutual negative perceptions of people.” People can perceive each other very negatively, but not conflict. Only as a result of actions directed against each other, an interpersonal conflict arises. Thus, interpersonal conflict is a clash of two or more individuals, the reasons for which are incompatible needs, interests, values, roles, goals or means of achieving them. As in other social conflicts, in interpersonal can also be identified objective and subjective reasons. (Andreeva 2003)

Objective factors create a base for conflict emergence. It is also possible to consider conditionally objective the social relations that had developed at the time the conflict emerges between potential participants of the conflict, for example, their status and role positions. Objective reasons are those, the occurrence of which does not directly depend on the will and desire of a potential subject of interpersonal conflict.

Subjective factors in interpersonal conflict develop on the basis of individual (socio-psychological, physiological) characteristics of conflicting personalities. Interpersonal conflicts arise both between the first meeting and constantly communicating people. In both cases, an important role in relationships is played by interpersonal perception - perception, i.e. assessment and understanding of person by a person.

The structure of interpersonal perception

The process of interpersonal perception has a complex structure:

- 1) identification - comparison, contrast of a person and identification of himself/herself with him;
- 2) socio-psychological reflection - understanding of another by thinking for him;
- 3) empathy - understanding of another person through compassion;
- 4) stereotyping - the perception and evaluation of another person by spreading on him/her the qualitative characteristics of a social group. (Kozyrev 2008)

In social psychology, the process of reflection involves at least six positions characterizing the mutual reflection of the subjects: the subject himself, what he really is; the subject as he sees himself; the subject as he is seen by another. In the relationships of subjects, we have the same three positions on the part of another subject of reflection. The result is a process of doubled, mirror reflection by subjects of each other. Often the causes of interpersonal conflicts become a miscomprehension or misun-

derstanding of one person by another. This happens because of different ideas about the subject, fact, phenomenon.

In the interpersonal interaction an important role is played by the individual qualities of the opponents, their personal self-esteem, individual threshold of tolerance, aggressiveness, type of behavior, sociocultural differences, etc. There are the concepts of “interpersonal compatibility” and “interpersonal incompatibility” (Grishina 2008). Compatibility involves the mutual acceptance of communication partners and joint activities. Incompatibility - mutual rejection or antipathy of partners, based on the mismatch of value orientations, interests, motives, characters, temperaments, psychophysical reactions, individual psychological characteristics.

Sometimes interpersonal contradictions and conflicts are based on differences in individual biological rhythms. One type of people is more active in the morning. The peak of activity of another type of people falls in the afternoon. If each of these types does not take into account the features of the other, then their interaction threatens with various kinds of conflicts. Especially often, such conflicts occur between close people: spouses, relatives, friends, etc.

Interpersonal incompatibility can cause emotional conflict, i.e. psychological antagonism, which is the most complex and difficult to resolve form of interpersonal confrontation. The difficulty in resolving such a conflict lies in the fact that the real reason for the emergence of contradictions does not seem to exist and the conflict arises, as it were, for no apparent reason. The reason for such conflict is a negative mutual assessment and inadequate mutual empathy of opponents by each other.

In the development of interpersonal conflict, it is also necessary to take into account the impact of the surrounding social, socio-psychological environment. Interacting with other people, a person first of all protects his/her personal interests, and this is quite normal. The resulting conflicts are a reaction to obstacles to achieving goals. And the fact that the subject of the conflict seems to be significant for a particular individual will largely depend on its conflicting attitude - its disposition and willingness to act in a certain way in the alleged conflict. It includes goals, expectations and emotional orientation of the parties.

But individuals clash in interpersonal conflicts, protecting not only their personal interests. They can also represent the interests of individual groups, institutions, organizations, labor collectives, society as a whole. In such interpersonal conflicts, the form of struggle and the possibility of finding compromises are determined by the conflicting attitudes of those social groups whose representatives are the subjects of the conflict.

The conflict of psychological incompatibility is a negative mutual assessment and perception by opponents of each other. The danger of such a conflict lies in the fact that incompatibility may not express itself for a certain period of time in the relationships of individuals - exist at the sub-conscious level, but in a specific, difficult situation cause a fierce interpersonal conflict.

Types of interpersonal conflicts and psychological culture of communication

The most characteristic of interpersonal conflicts are the following types.

1. Incompatible needs, desires, interests, goals, values, etc.
2. Incompatible means of achieving common needs, interests, goals
3. Limited material resources (money, apartment).
4. Conflict of dominance is manifested in the desire of one subject to impose his will on another and the unwillingness of others to obey
5. Conflict of status positions - when individuals claim the same social status or inadequately assess the statuses held by opponents, for example, a child disputes the power of a parent, a citizen - power official.
6. Role conflicts can be divided into three subspecies:
 - two or more individuals seek to fulfill the same role in a social group;
 - Inadequate assessment of the role by another individual;
 - The performance of two or more difficult incompatible roles.
7. A conflict of possession is most characteristic of individuals who are in close relationship with each other (friends, parents - children, spouses, lovers), when one or both persons want to individually own and dispose of the other
8. Conflict rivalry or competition occurs when two or more individuals compete with each other in any kind of activity, as well as in strength, wealth, intelligence, courage
9. Unrealistic conflict. As already mentioned above, such a conflict does not arise about some object, but because of the inadequate mental state of one or both of the subjects of the conflict. Here, conflict is not a means to achieving goals, but a goal itself. (Antsupov & Shipilov 2008)

Interpersonal conflicts cover almost all spheres of human relations. As a result any conflict comes down to interpersonal. Mastering the psychological culture of communication is associated with the need to master at least its three main components (skills): • to understand people, adequately assessing their behavior; • emotionally respond to their condition; • choose, in relation to each of them, such a method of treatment that does not diverge from the requirements of morality and meets their

individual characteristics. In every culture, in every community of people there is a kind of “code” of approved models and rules of communication. For each type of communication and for each individual situation, a system of certain unwritten prohibitions and permits for the use of certain forms of behavior, methods of contacting each other has developed. But there are also universal rules, the observance of which is desirable and even necessary in any interpersonal situations. Their main meaning is to unite people, create a healthy social atmosphere and provide comfort in communication. In any communication, you should avoid such patterns of behavior that disconnect people, destroy their community. There are some of the most common moral rules, following which can help in a situation of any interpersonal interaction:

- avoid such forms of treatment that humiliate the opponent;
- not to allow forceful pressure or threats in communication;
- restrain manifestations of irritability in relation to others;
- avoid arrogance and demonstrative opposition to other people.

(Ovsiyannikov & Seriskova 2015)

The main sense of these rules is not to belittle the dignity of others, nor to create prerequisites for tension and discomfort. According to psychologists, after every minute of conflict showdowns, a much longer period of mental adaptation to new realities is required - from about six to twenty minutes, depending on the properties of temperament and the nature of the person. You can see the immediate causes and sources of interpersonal conflicts by addressing the basic needs of a person. This refers to the need for food, security, self-esteem, justice, kindness, etc. When they are suppressed or there is a threat to their satisfaction, tension builds up and conflicts arise between people.

The importance of a culture of human behavior is especially high in professional communication. The ancient Greek philosopher Socrates noted that those who know how to deal with people conducts private and general affairs well and those who do not know how to do that make mistakes everywhere. Back in 1936, Dale Carnegie, a specialist in human relations, noted that the success of a business person and his financial well-being only 15% depend on the level of his professional qualifications and 85% on his ability to communicate with people.

In almost any pre-conflict situation, there is the possibility of a choice - a conflict or one of the non-conflict methods of resolving it. The manifestation of the personal causes of conflicts takes place both in the external environment of activity and in intra-system communication. In order to resolve the conflict, it is first necessary to analyze the conflict situation. This

analysis includes the following areas: - finding out the causes, and not the causes of the conflict; - determination of the conflict zone, i.e. the inclusion of certain forces; -clarification of the motives for including people in the conflict. It should be remembered that the wording, explanation of the reasons may not coincide with the true motives. Conflict resolution may be complete and incomplete. Full resolution of the conflict is achieved by eliminating the causes, subject of the conflict and conflict situations. Incomplete conflict resolution occurs when not all causes or conflict situations are eliminated.

The basic models of personality behavior in a conflict situation are constructive, destructive, conformist. The constructive model seeks to resolve the conflict; aims to find an acceptable solution; distinguished by endurance and self-control, a friendly attitude to the opponent; open and sincere in communication. Destructive is constantly striving to expand and exacerbate the conflict; constantly belittles the partner, negatively evaluates his personality; shows suspicion and distrust of the opponent, violates the ethics of communication. Conformist model - passivity, tendency to make concessions; inconsistency in estimates, judgments, behavior; avoiding sensitive issues and personal responsibility.

Conclusion

Depending on the causes of the conflict, the interests and goals, the balance of opposing forces, the conflicting behavior of the parties, an interpersonal conflict can have the following outcomes:

1. Avoiding the resolution of the conflict when one of the parties does not seem to notice the contradictions that have arisen. Such behavior can be associated either with a clear superiority in the strength of one of the parties, or with the fact that at the moment there are not enough opportunities to resolve the contradictions that have arisen;
2. Mitigation of contradictions when one of the parties either agrees with the claims presented to it (but only at the moment), or seeks to justify itself. Such behavior may be due to either the desire to maintain normal relations, or the fact that the subject of the dispute is not significant for one of the parties;
3. Compromise - mutual concessions on both sides, the size of the concessions depends on the ratio of opposing forces;
4. Consensus - finding a mutually acceptable solution to a problem. With this option, the parties can turn from opponents into partners and allies;
5. The escalation of tension and the escalation of the conflict into a comprehensive confrontation: mutual readiness for an uncompromising struggle;

6. the power version of the suppression of the conflict, when one or both parties are forced to accept by force one or another version of the outcome of the contradiction. Thus, in order to identify the causes of conflicts, a comprehensive analysis of the actions, positions and psychological characteristics of its participants, as well as the circumstances that arise in the situation of their interaction, is needed. Conflict-free interaction, analysis of conflicts, their causes, varieties and patterns of manifestation, helps to more competently solve the problems of forecasting and prevention of conflict situations, to choose adequate methods and techniques for practical resolution and resolution of conflicts.

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SOCIAL-PSYCHOLOGICAL FEATURES OF FORMATION OF LEADERSHIP AMONG HIGH SCHOOL STUDENTS

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The availability of leadership capabilities is determined by such personal features as logical thinking, emotional stability, courage and independence, managerial ability, and also pragmatism, practicality, and realness. Training of future leaders is a strategic task not only in a higher education institution but also in the state in general. The solution of this problem is connected with providing the corresponding psychology and pedagogical and organizational conditions to form leadership skills and develop of leadership potential within a teaching and educational process. The importance of forming leadership skills is determined by the development of capabilities of a reflection, rendering a positive impact on people, an active and responsible attitude to society and socially significant activities.

Keywords: leadership, leadership skills, student, student's self-government, education, development

At the present stage of development of society, by one of the important directions of the state youth policy is ideological and educational work with young students. According to this innovative task, which is set for the national higher education system, development of leadership skills of students is that it has to create highly qualified specialists active civic stand and responsibility, ability deliberately and objectively assess events which are taking place in the country and society. Formation and development of a new personality, socially active, comprehensively developed, capable to find that place which will correspond to her abilities and features in society belongs to relevant requirements of modern society. Today, the leadership is considered as the system of the qualities reflecting the degree of

focus on the subject transforming reality, including itself, which belongs to a number of the most demanded and professionally significant characteristics of the personality. In constantly changing social, economic and political conditions, which are characterized also by a condition of crisis, it is important to provide training for specialists in the sphere of psychology, capable to the organization of the professional activity in the conditions of fierce competition and also to atypical approach in the solution of current problems of society. The system of higher education underwent significant changes in the last two decades. It was influenced by peripeteia of transition to the market economy, destructions of ideological cliches, formations of a new paradigm of pedagogical activity. Similar processes brightly affect contents and the nature of the educational activity of the higher school.

The system of higher education

Education – the major public institution responsible for accumulation, storage, and dissemination of knowledge, ethical, esthetic standards, etc. and on this basis – for the preparation of intellectual and its professional potential without which further development of society is impossible. Today, conditions of development of the higher education system and the purpose of high school training quickly and sharply change under the influence of many factors, including globalization and information and communicative revolution. Their influence on the development of an education system was caused by such processes as remote education, internationalization, commercialization, privatization of education (Sergeeva 2010, p. 18).

Before an education system, especially in the sphere of training of professional heads, the problem of search, selection and vocational training of the most capable, talented youth, a problem of formation of the new intellectual elite, leaders of the XXI of the century is particularly acute. The identity of the real leader can be created in the corresponding educational and professional environment. With the development of modern information technologies, application in the educational process of active methods training and emergence of a possibility of use in the educational process of remote technologies, there was an opportunity to develop some qualities of the personality including the leader, directly on occupations with students.

The Phenomenon of Leadership

Leadership is the relation of domination and submission, influence and following to this influence in the system of the interpersonal relations in the organization. Therefore, in the broadest sense, leadership is one of the

ways of the organization and management of a group that allows to unite the concepts “leader” and “head”. Despite their distinctions, development of qualities of the leader also contributes to the development of qualities of the head. As the social and psychological phenomenon, leadership acts as an element of the organization of joint activity and management in the system of interpersonal relations. The phenomenon of leadership of the personality in the conditions of group (collective) is the result of actions of a complex of factors as objective and situational (the purposes and tasks of group in a concrete situation), and subjective, personal and social and psychological (interests and requirements, individual and typological features and valuable orientations of contact group). These factors objectively and subjectively cause themselves actions of the leader as initiator and organizer of group activity and interaction. Formation of leadership is a process and result of the development of the structure of the internal psychological organization of the personality in the unity of their manifestation in personal organizing and her communicative readiness for external management of communication and activity of members of the group and collective (Larionov & Melnikov, 2001).

The leadership of the personality in a student's community is formed based on the superiority of personal qualities of separate subjects of activity and interaction in the group, at psychological readiness of the personality to solve a group problem in a practical field of activity. “The leader is a member of the group who spontaneously moves the forward group for a role of the informal head in the conditions of certain specific and, as a rule, rather significant situation to allow the organization join a collective activity of people for the fastest and successful achievement of the common goal facing this group” (Naletova 2004, p.57). Today's student can be a head-on division of the enterprise, the organization, etc. tomorrow. Therefore, it is an important task to teach young people to combine successfully the future formal position, a role of the formal leader, with qualities of the leader informal. System approaches to the training of leaders are for this purpose necessary: development of the training programs, social projects.

The student's environment is that resource in which formation of leaders (i.e. representatives of different elite groups of society) is optimum in terms of age and the level of knowledge: this group only enters active life. Nevertheless, it already has certain knowledge. The main thing – at this group – is vital ambition without which leadership is also impossible, as well as without knowledge. Despite a significant increase in students in absolute and relative numbers in comparison with the Soviet period, the

competition at entering higher education institutions is notable: not all persons are interested in become students. Therefore, the youth pass through the system of tough “selection” at entering a higher education institution, where qualities of a future leader can help to be “accepted”. It is represented that in the course of selection, there is already an opportunity to prove that young people have leadership skills. A task of higher education institutions – to reveal them on the first year of training and help to develop leader potentialities, and then – at a job placement – to provide a possibility of implementation of the gained knowledge and the acquired skills.

Social-psychological features of leadership

In the formation and development skills in students in the higher education system, the body of the Student Government is of particular importance. As the important place in realization of all directions of educational activity is allocated to student government, it needs to be considered not only as initial activity of students directed to the solution of important questions in various spheres of student's life, but, first of all, as one of forms of educational work in higher education institution. “Student government” is the active form of the organization of activity of students contributing to the development of their independence in decision-making and responsibility for the received results on achievement socially and personally significant purposes (Mikhailichenko 2004, p.115). Development of leadership skills is a purposeful process of creative interaction of students with one another, with teachers, social partners, the qualities of the personality connected with the leader status, to gain the experience of leader behavior allowing to develop.

Having acknowledged the possibility of development of leadership, it is necessary to understand which leadership skills need to be developed as to how to reconstruct an educational system of students, the culture of education in general in time to reveal future leaders, to bring up them, to support and advance their leadership potential. It is necessary to provide a possibility of creation of pedagogical conditions for the formation of leadership skills in students in the course of their training in a higher education institution.

It is quite fair that the basis of the process of formation of leadership skills of the personality for a the modern student is made up of: first, objective macro factors of a social order (public relations and social and economic environment); secondly, meso factors of action of the next Wednesday (moral and psychological unity of heads and subordinates, social and official position, official functions of leadership team, etc.); thirdly, micro factors (the personal and psychological conditions influencing process of

formation of leadership skills of the personality). The main criteria of identification of leadership are psychological readiness of the personality for leadership (internal criterion) and real manifestation of leadership skills of the personality in activity and interaction with the collective (external criterion) (Hogg 2007). These criteria allow to see objectively the effectiveness of the process of formation of leadership skills in students, a phenomenon of leadership as it is shown in the behavior of future experts as the leader.

Socially - pedagogical conditions allow to develop leadership skills of students through a vigorous socially important activity. The active socially important activity provides the conscious, purposeful action focused on a relevant concrete situation, built based on own motivation of conscious decision-making and understanding of responsibility for consequences of the actions. Psychological features of the development of leadership skills of students in the course of training in higher education institutions are the features of socialization and adaptation of the personality, development of consciousness, the feature of activity, the interaction of students and teachers, features of intragroup interaction of students. Socialization of the personality in student's years in many respects depends on adaptation to a group. In this period, the identity of a student faces different representatives of students in an intellectual and cultural plan. Some students, carriers of the best examples of behavior, morality, intelligence, can contribute to the development of leadership skills, others, on the contrary, will give outdated stereotypes, defective views, the negative principles, which can negatively affect the current level of development of leadership skills. Therefore, the process of adaptation and entry of the personality into a student's community has to be under observation and control, otherwise, the distribution of negative trends that will interfere with consecutive development of leadership skills are not excluded. Development of leadership skills of future experts is possible to master also on the condition of the creation of a system of the educational and practical situations aimed at the development of ability in them independently new experience, to analyze the activity, to make decisions which are as close as possible to real professional activity. All this can be realized in the course of the application of the active personal focused forms of education. However, it should be noted that by the end of the training there are already created leaders who take the responsibility for the decisions made, are more active on occupations, often make answers when performing tasks of the teacher while the rest of the group is more passive. Therefore, a teacher should consider the developed groups and apply such methods of work, which would allow students to show the knowledge, to especially diffident students.

Conclusion

The most specific abilities can be developed through participation in student's organizations and public work, especially in the activity of student government. Thus, the model of development of leadership skills of students inactivity of student government represents a complex of the interconnected, dynamically developing blocks of open type, which are flexibly built in a context of inquiries of labor market and the state on training of the competitive, professionally mobile university graduates, ready to manifestation of the leadership skills in the course of the solution, not of standard problems of professional and personal activity.

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FEATURES OF ANXIETY OF PRESCHOOLERS TRAINING IN DIFFERENT CONDITIONS

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The article presents the results of a study of anxiety in preschoolers who are brought up in different conditions: in a family, a Children's Village and an orphanage. The peculiarities of anxiety of preschoolers, conditioned by different conditions of upbringing, were revealed.

Keywords: anxiety, family, children's village, orphanage.

Introduction

The problem of the occurrence of anxiety in preschool children is one of the most urgent.

Various unfavorable conditions in which the child is completely or partially deprived of parental warmth, care, complicate the child's life, his interaction with the world around him, make it difficult to master new social roles, destroy balanced emotional states, causing increased anxiety.

There is a need to timely identify the sources and characteristics of anxious emotional states of preschool children, who are brought up in the family and outside it.

Scientists interpret the concept of "anxiety", on the one hand, as a mental state (N.D. Levitov), on the other hand, as a stable property, personality trait or temperament, and as an emotional state (A.M. Prikhodzhan). We consider this concept as a short-term, complexly determined state that arises during the situational experience of anxiety due to the dissatisfaction of urgent needs.

Study of anxiety in preschoolers brought up in different conditions

The study involved 300 preschool children from 5 to 6 years old, brought up in a family, in the Children's Village and an orphanage.

The following complex of methods was used to study anxiety in preschool children:

1. research of the emotional state of the child - "Observation Map" (D. Stott);
2. test diagnostics of the level of anxiety - "Choose the right person" (R. Temple, M. Dorky, V. Amen);
3. diagnostics of emotional states - "Color solutions" (S.S. Kharin, O.G. Ksenda);
4. the ability of children 5-7 years of age to recognize emotional states (Listik E.M.).

The analysis carried out on the basis of observation, quantitative and qualitative processing of the primary diagnosis of anxiety in children brought up in a family, Children's Village and an orphanage showed the following:

1. High anxiety is observed both in children raised in a family and in the Children's Village and in the children's home.

2. Children of all three conditions of upbringing have high interpersonal anxiety, which manifests itself both in the system of relations "child - child" and in the system "child - adult". However, for the overwhelming majority of children of all groups of upbringing, the zone of heightened anxiety is the system of relations "child-child", which is perceived by children as the most significant.

3. In situations that simulate the relationship "child - adult", negative choices, as a rule, are caused by an unmet need for parental love, a lack of emotionally positive contacts with an adult.

4. The high anxiety of the tested preschoolers correlates with the inability to recognize emotional states. The manifestation of interpersonal anxiety in preschool children, who are brought up both in the family and outside the family, is based on personal qualities associated with the low development of social perception, due to different conditions of socialization.

5. Preschoolers who are brought up in the family and outside the family, correctly describing emotional states at the verbal level, experience significant difficulties in recognizing emotional states at the non-verbal level.

6. High anxiety and insufficient development of social perception of children negatively affect the interpersonal interaction of children with each other and with adults.

7. The features of anxiety of children brought up outside the family are highlighted:

- the indicators of anxiety levels among children from the Children's Village are close to those of children from families (46% of chil-

dren from a family, 48% of children from the Children's Village); among children from an orphanage, the majority of children experience high anxiety - 54%;

- when diagnosing the levels of the index of success in recognizing emotional states: the majority of children from the orphanage (74%) are characterized by a low level of the index of success;

- the greatest difficulties for the majority of children from the orphanage are caused by the designation of categories of emotional states (31%) and differentiated recognition of their own emotional states (74%) and the states of adults (89%);

- in interpersonal interaction with adults, children brought up outside the family are more direct, persistently attract the attention of adults to themselves, are poorly focused on behavioral norms in communication (they interfere with the conversation of adults with other people, are impatient, sometimes obsessive, persistently ask to give them the thing they like and etc.);

- a third of children from an orphanage (32%) experience a high level of emotional stress, which is manifested in interpersonal interaction with other children. In addition, they are characterized by insufficient activity in games, alertness, withdrawal. Hostility towards peers is expressed by 28%, namely: they interfere with other children in their games, express offensive remarks, like to scare, stick to weak children, hide or spoil objects that do not belong to them, etc. ;

- lack of emotional attachment of children to each other (what is cultivated in the family and in the Children's Village), lack of empathy, the ability to understand the state of another, the ability to empathize, immersion in their own experiences leads to emotional impoverishment of children. A significant part of the children from the orphanage have negative emotional experiences, which are reflected in the inadequate perception of the characters and the plot of the situations being read, in the weak emotional coloring of perception.

- Pupils of the orphanage begin to differentiate between positive and negative emotions of an adult later than family children.

Thus, in order to overcome anxious emotional states, it is necessary to develop adequate social perception in children, to increase their own positive social activity.

Conclusion

The performed diagnostic study revealed that:

1. Children of all three groups with different conditions of upbringing

have a high interpersonal anxiety, both in the system of relations "child-child" and in the system of "child-adult", and in the system of relations "child-child" the level of anxiety is higher than in the system "child - adult" - this allows us to conclude that the relationship between preschoolers and peers is of high importance.

2. There is a link between anxiety in preschoolers and a lack of social perception skills. Highly anxious children, have insufficient emotional experience, have a vague idea of social emotions. Recognition of human emotional states in most of them is below normal.

3. High anxiety and insufficient development of social perception of children negatively affects the construction of interpersonal interaction of children with each other and adults (conflicts, manifestation of aggression, closeness, withdrawal, lack of empathy).

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DYNAMICS OF THE CIRCADIAN RHYTHM OF BLOOD PRESSURE DURING TOXEMIA OF BURN INJURY IN SCHOOL CHILDREN

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The more severe the injury, the greater the daily range of fluctuations in SBP, DBP on the first day. The general tendency to an increase in the mesor of the circadian rhythm SBP and DBP on days 8 and 9 in group 1 can be explained by a decrease in stress-limiting drug correction in the process of preparation for transfer from ICU. The increase in the DBP mesor on days 10, 17 in children of group 3 was most likely due to a decrease in the effectiveness of stress-limiting therapy against the background of an exacerbation of the systemic inflammatory response caused by insufficient effectiveness of antibacterial, anti-inflammatory therapy in conditions of thermal damage to the skin surface 2-3A degree $25.8 \pm 11.4\%$, 3B degree $22.5 \pm 6.6\%$ and IF 95.8 ± 19.1 units. The more severe the injury, the more pronounced the increase in amplitude and range, the deformation of the phase characteristics of the daily and about weekly periods of SBP and DBP oscillations. The period of toxemia of severe burn injury is characterized by the longest inversion of the circadian rhythm of DBP (over 50% of the period of toxemia) in the most severe patients of group 3.

Keywords: circadian rhythm, blood pressure, period of toxemia, school-age children

Relevance. The analysis of the temporal organization carried out by the authors (Datieva F.S., Dudieva L.Z., Tagaeva I.R. 2017) showed that

100% of the victims had pathological desynchronization, in the spectrum of reliable rhythms based on the length of the period in burn patients, almost 3 times higher than in the control. Despite the fact that normal rhythms reflecting the regulation of blood pressure are circadian, in patients with chronic burn toxemia only single circadian rhythms are present, in most cases, ultradian and infradian rhythms prevail, while adaptation mechanisms "swing" the periods rhythms in the search for adaptation, which leads to the fact that the program complex for chronobiological analysis on the basis of the same data calculates several statistically significant variants of the biorhythm implementation. However, the data of hemodynamic studies during the period of toxemia are very scarce. In this regard, the relevance of the problem of studying BP during the period of toxemia of burn disease is obvious, since it is during this period that intensive therapy is distinguished by the greatest specificity and is an important determinant of the treatment outcome.

Purpose of the study. Study the dynamics of the circadian rhythm of systolic and diastolic blood pressure during burn toxemia in schoolchildren.

Material and research methods. The clinical material is presented by the data of hourly monitoring of systolic (SBP) and diastolic (DBP) blood pressure in children admitted to the Republican Scientific Center for Emergency Medical Aid (RSCEMA) in connection with thermal burns at the age from 7.1 to 18 years. The indicators of the circadian rhythm of SBP were studied in 26 children aged 7.1-18 years with severe burns during the period of toxemia. The main sign that determined the division into groups was the duration of intensive care in the conditions of the intensive care unit (ICU), due to the severity of the burn disease. In group 1, SBP monitoring data were considered in 12 children (up to 10 days on average 7.3 ± 1.1), in group 2 in 7 (11-20 days on average 12.7 ± 1.2), in 3 - in 7 children (more than 21 days 28.8 ± 4.8).

Table 1
Patient characteristics

	Age in years	boys	girls	Days at ICU	Burn area and depth		IF, cu
					2-3A degree, %	3B degree, %	
Group 1	11,4 \pm 3,2	10	2	7,3 \pm 1,1	41 \pm 11	6,6 \pm 6	57 \pm 11
Group 2	15 \pm 2	6	1	12,7 \pm 1,1*	55,1 \pm 14,4	4,8 \pm 3,5	86,3 \pm 15,7*
Group 3	9,7 \pm 1,5 [≈]	4	3	28,8 \pm 4,8 [≈]	25,8 \pm 11,4 [≈]	22,5 \pm 6,6 [≈]	95,8 \pm 19,1*

*- difference is significant relative to the research data in group 1

[≈]- the difference is significant relative to the indicator in group 2

As presented in Tab. 1, the average age of children in group 3 was 9.7 ± 1.5 years, it turned out to be significantly less than in group 2 by 6 years (15 ± 2), and in group 1 by 2 years (11.4 ± 3.2). In all groups, male children predominated, accounting for 83% in group 1, 85% in group 2, and 56% in group 3. The average duration of intensive therapy in ICU conditions in group 1 was 7.3 ± 1.1 days, in group 2 it was 77% longer, in 3 - 4 times longer than in group 1. The increase in the duration of intensive therapy was in direct relationship with the IF index and an increase in the area of thermal skin damage with a depth of grade 3B. So, in children of group 3, a 3B degree of burn with an area of 22.5 ± 6.6 was revealed, which is 3 times more than in children of group 1 and 5 times more than in group 2. The IF indicator turned out to be the largest in group 3, amounting to 95.8 ± 19.1 units, 9 units less in group 2, significantly less in group 1 by 38 units ($p < 0.05$). The absence of a direct dependence of the IF change on the area of the lesion in group 2 is due to the fact that in 4 children the aggravation of the condition was caused by combined trauma - in 1, carbon monoxide poisoning, in 3 - burns of the upper respiratory tract.

Results of the study.

Table 2

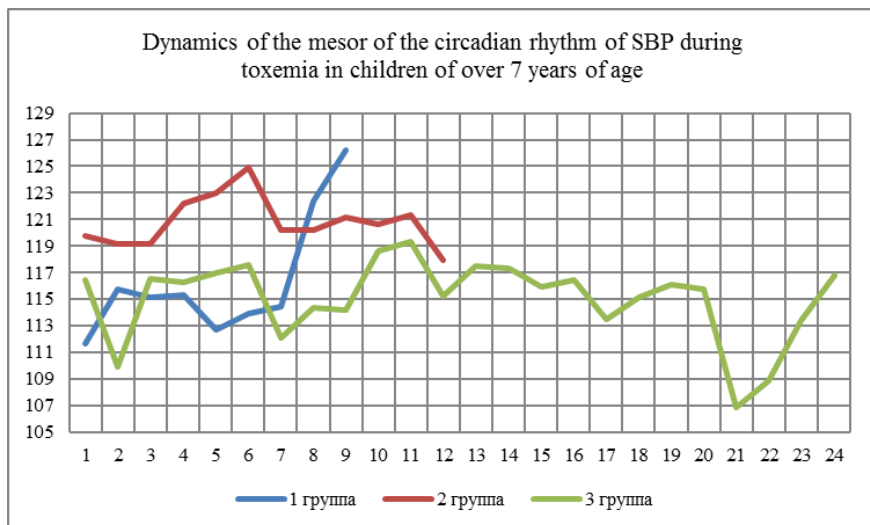
Dynamics of the mesor of the circadian rhythm of systolic and diastolic blood pressure during toxemia in children over 7 years old

	Systolic blood pressure, mmHg			Diastolic blood pressure, mmHg		
days	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3
1	112 ± 3	120 ± 4	116 ± 6	$63,2 \pm 1,9$	$68,3 \pm 3,3$	$62,9 \pm 3,2$
2	116 ± 2	119 ± 2	110 ± 3	$65,4 \pm 1,1$	$65,2 \pm 2,3$	$61,2 \pm 1,8$
3	115 ± 1	119 ± 2	117 ± 2	$64,9 \pm 1,3$	$66,2 \pm 1,6$	$66,5 \pm 2,0$
4	115 ± 2	122 ± 2	116 ± 2	$66,0 \pm 1,6$	$68,9 \pm 2,1$	$68,1 \pm 2,4$
5	113 ± 2	123 ± 1	117 ± 3	$64,3 \pm 1,5$	$68,5 \pm 1,6$	$65,9 \pm 2,3$
6	114 ± 1	125 ± 2	118 ± 3	$65,3 \pm 1,4$	$70,7 \pm 2,1$	$67,3 \pm 1,2$
7	114 ± 2	120 ± 2	112 ± 2	$66,3 \pm 1,8$	$65,5 \pm 1,8$	$65,1 \pm 1,4$
8	$122 \pm 3^*$	120 ± 3	114 ± 2	$64,9 \pm 3,2$	$68,0 \pm 1,8$	$66,4 \pm 2,2$
9	$126 \pm 4^*$	121 ± 2	114 ± 2	$70,2 \pm 2,3^*$	$66,2 \pm 1,8$	$68,3 \pm 2,0$
10		121 ± 3	119 ± 2		$62,1 \pm 3,5$	$70,4 \pm 1,6^*$
11		121 ± 4	119 ± 3		$71,5 \pm 3,9$	$64,1 \pm 2,0$
12		118 ± 5	115 ± 2			$66,6 \pm 1,1$
13			118 ± 2			$65,4 \pm 1,8$

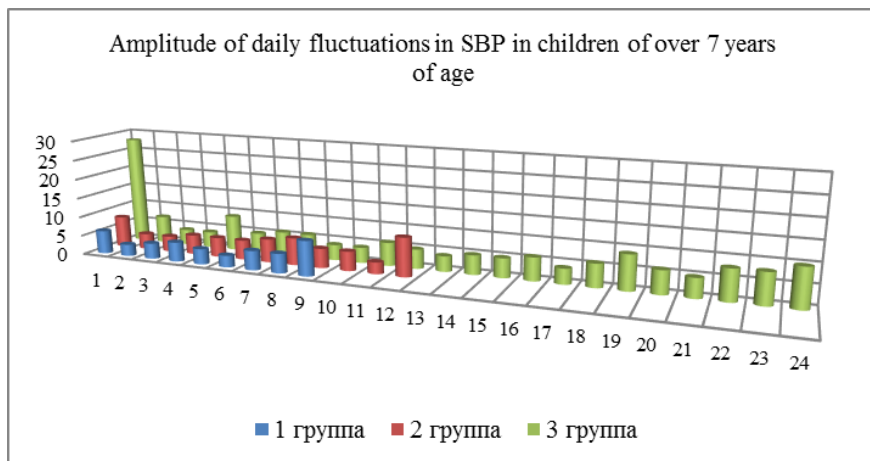
14			117±3			65,3±2,9
15			116±2			65,0±1,7
16			116±3			64,7±2,2
17			114±2			69,8±1,8*
18			115±2			67,0±2,0
19			116±3			63,4±2,0
20			116±3			64,6±1,9
21			107±2			62,1±2,0
22			109±3			65,0±2,2
23			113±4			66,7±2,0
24			117±9			70,4±3,9

*- reliably relative to the indicator on the first day

The parameters of the mesor of the circadian rhythm SBP and DBP on the first day did not practically differ from the age normative indicators. Group 1 showed an increase in SBP on days 8 and 9 by 8.8% and 12% ($p < 0.05$, respectively), an increase in the mesor of the circadian rhythm of DBP on days 9 by 11% ($p < 0.05$). During the period of toxemia in children of group 3, an increase in the level of the mesor of the circadian rhythm DBP on days 10.17 by 11%, 10% ($p < 0.05$, respectively) was revealed. The general tendency to an increase in SBP and DBP on days 8 and 9 in group 1 can be explained by a decrease in stress-limiting drug correction in the process of preparation for transfer from ICU. However, an increase in the DBP mesor on days 10, 17 in children of group 3 was most likely due to a decrease in the effectiveness of stress-limiting therapy against the background of an exacerbation of the systemic inflammatory reaction caused by insufficient effectiveness of anti-bacterial, anti-inflammatory therapy in conditions of thermal damage to the skin surface 2-3A degree $25.8 \pm 11.4\%$, grade 3B $22.5 \pm 6.6\%$ and IF 95.8 ± 19.1 units. Thus, in children over 7 years of age, the period of toxemia with damage to the skin surface of grade 2-3A is $25.8 \pm 11.4\%$, grade 3B is $22.5 \pm 6.6\%$ and IF of 95.8 ± 19.1 units is characterized by a decrease in efficiency. carried out complex intensive therapy in the first 10 days, as well as on the 18th day, manifested by an increase in the DBP mesor by 10%. The revealed features of the period of toxemia in children of group 3 suggest the advisability of revising the adequacy of treatment within the specified time frame with correction of the energy deficiency state and the closely related secondary immunodeficiency in children over 7 years of age.

**Fig.1**

As shown in Fig. 1, changes in the SBP mesor of the circadian rhythm occurred in waves with a period of fluctuations in the 1st group of 7 days, in the 2nd - 7th and 5th days, in the 3rd - 4,5,5,5,5 days, characterized by a changing amplitude, deformation phase characteristics, although the average values did not differ from the standard indicators (Fig. 1).

**Fig.2**

Changes in the amplitude of the daily fluctuation of SBP (Fig. 2) are presented by maximum values at 1,4,9 days in group 1 of children, at 1,8,12 days in the second group, at 1,6,19,24 days in children of group 3. The change in the amplitude of daily SBP fluctuations is most likely adaptive in nature under conditions of exposure not only to the burn injury itself, but also to external influences (infusion therapy, parenteral nutrition, administration of medications, etc.), when a compensatory mobilization of the functional activity of organs and systems that ensure adaptation of the body is required to changing conditions of existence. It is believed that a decrease in the amplitude of daily fluctuations of the indicator indicates a decrease in adaptive capabilities, and an excessive increase in the amplitude quickly leads to depletion of the energy resources of working cells and tissues, which portends an unfavorable outcome of this serious condition. Thus, it can be logically assumed that low-amplitude fluctuations, as well as an excessive increase in the amplitude of daily SBP changes, should be corrected in a timely manner. In both situations, timely prevention of the development of an energy deficit state at the cellular level is necessary.

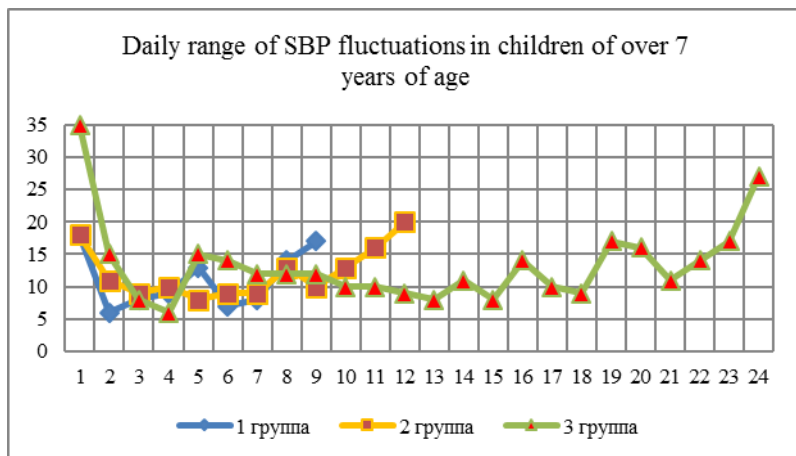


Fig.3

Changes in the daily SBP range during the period of toxemia (Fig. 3) in group 1 occurred in waves with an oscillation period of 5, from 4 days, with an amplitude of 5 mmHg, 4 mmHg. In group 2, waves with an oscillation period of 8 and 4 days with an amplitude of 7 mmHg, 5 mmHg were also detected. In group 3, the maximum daily SBP range of 35 mmHg on

day 1 was due to the severity of burn injury, an increase in the indicator on 24 days to 27 mmHg can be explained by a decrease in efficiency of the ongoing complex therapy, leading to an exacerbation of the systemic inflammatory reaction, will determine the need for timely revision and correction of the treatment. Changes in the daily SBP range also occurred in waves with oscillation periods of 5, 9, 4.4, 4 days with an amplitude within 5-10 mmHg. Thus, in the process of adaptation during the period of burn toxemia, with normal daily average SBP values, there were changes in the reaction of compensatory mechanisms, manifested by changes in the amplitude and daily range of fluctuations in the circadian rhythm of SBP. The more severe the injury was, the more pronounced the increase in amplitude and range, the deformation of the daily and near-week periods of SBP fluctuations.

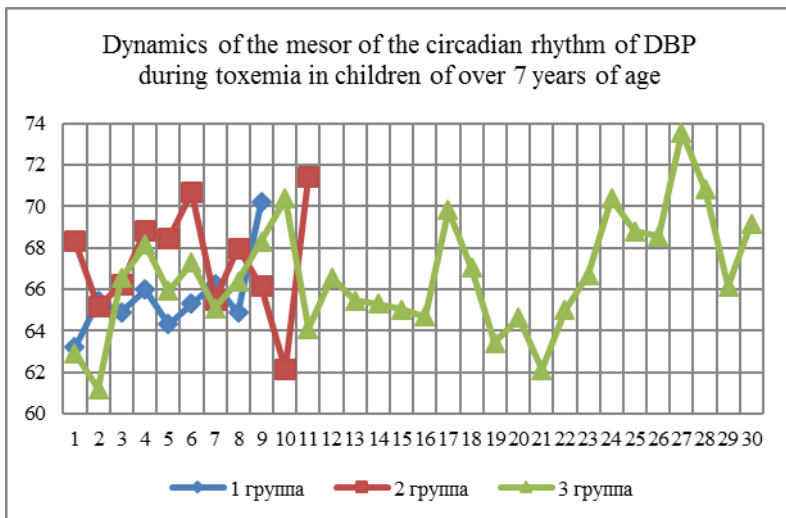
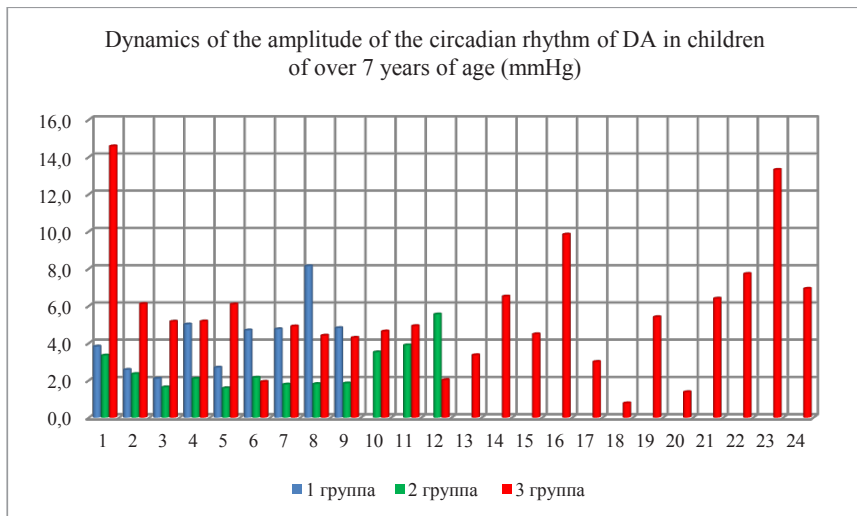
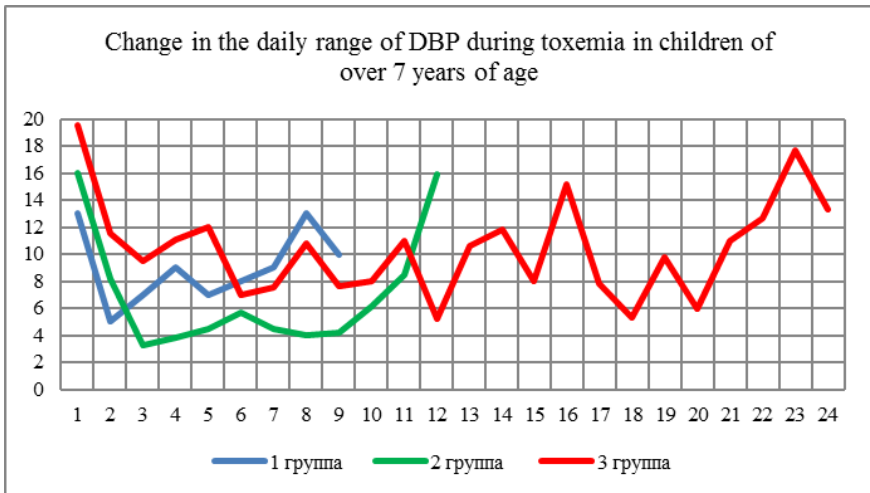


Fig.4

As can be seen from the data presented in Fig. 4, fluctuations in the mesor of the DBP during the period of toxemia in children of group 1 also occurred in waves with a period of fluctuations of 5 and 4 days with an amplitude of 5 mmHg and 8 mmHg (Fig. 5). In group 2, changes in the mesor of the circadian rhythm DBP are presented in the form of two sinuoids with a period of 6 and 5 days, an amplitude of 3 - 5 mmHg (Fig. 5).

**Fig.5**

In group 3, the wavelike nature of changes in the mesor of the circadian rhythm was represented by sinusoids with a period of 7,5,5,5 days with a maximum amplitude of 14 mmHg, 13 mmHg on the first and 23 days, and minimum amplitude values of 0.5-1 mmHg on days 18 and 20. A significant decrease in the amplitude of the daily fluctuations in DBP should be understood as a manifestation of the inconsistency of the adaptive capabilities of hemodynamics in the later periods of toxemia, as an indicator of an increased risk of complications (compensatory insufficiency of homeostasis systems, caused by a decrease in the functional activity of the peripheral vascular tone during adaptation under conditions of increased body oxygen demand, nutritional substrates, etc.), the main cause of which is severe intoxication against the background of the energy deficit state of the cell.

**Fig.6**

The change in the daily range of DBP during the period of toxemia in patients older than 7 years (Fig. 6) also occurred in an oscillatory cycle with periods of 5 and 4 days in group 1. Group 2 showed two deformed sinusoids with a period of 6 days. In group 3, the periods of fluctuations in the daily range of DBP consisted of 5, 4, 4, 4, 4, 4, 5 day sinusoids. The maximum values of the daily range of DBP fluctuations in all patients were observed on the first day, amounting to 13 mmHg in group 1, 16 mmHg in group 2, and 19.5 mmHg in group 3. That is, the more severe the injury, the greater the daily range of DBP fluctuations in the first day.

Table 3

The duration of the displacement of the acrophase of the circadian rhythm of systolic and diastolic blood pressure

	Systolic blood pressure			Diastolic blood pressure		
	norm	daytime offset	inversion	norm	daytime offset	inversion
Group 1	0	88% (8 out of 9)	12% (1 out of 9)	22% (2 out of 9)	78% (7 out of 9)	0
Group 2	16% (2 out of 12)	34% (4 out of 12)	50% (6 out of 12)	8% (1 out of 12)	75% (9 out of 12)	17% (2 out of 12)
Group 3	21% (5 out of 24)	50% (12 out of 24)	29% (7 out of 24)	8% (2 out of 24)	42% (10 out of 24)	50% (12 out of 24)

As shown in Tab. 3, Fig. 7, in group 1, the duration of the SBP acrophase shift in the daytime prevailed (88%), in group 2, the duration of the SBP acrophase shift at night time prevailed (50%), in group 3, for 50% the duration of toxemia, the peak of acrophase migrated in the daytime. The disposition to spasm of peripheral vessels in the daytime was revealed for 78% in group 1 of children, 75% in children of group 2 and for 42% of the period of toxemia in group 3. Moreover, in group 3, more serious shifts in the acrophase of the circadian rhythm of DBP at night hours were found during 50% of the period of toxemia. Thus, the most severe burn injury on the background of complex intensive therapy caused the most prolonged pronounced mechanisms, possibly of a compensatory nature, manifested by prolonged spasm of peripheral vessels, manifested by inversion of the circadian rhythm (12 days out of 24) of DBP in children of group 3. In children of groups 1 and 2, the duration of migration of the acrophase peak of the circadian rhythm DBP in the daytime prevailed (Tab. 3, Fig. 8).

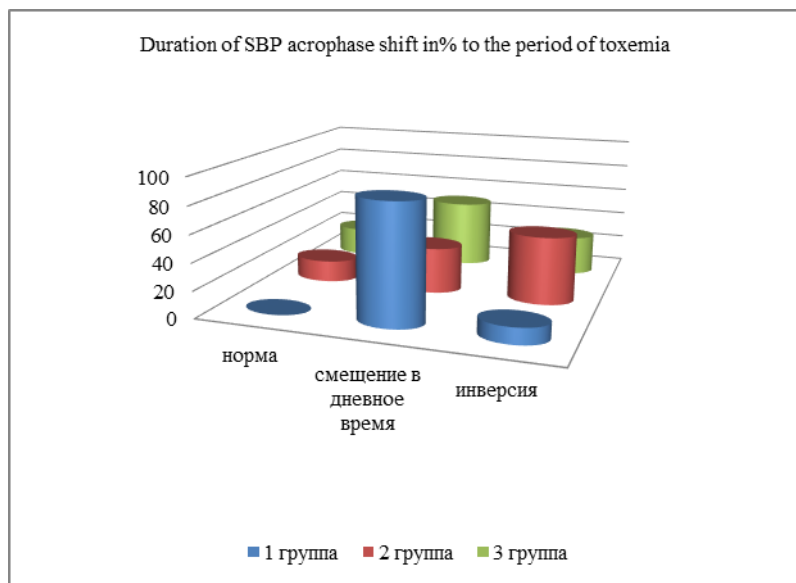
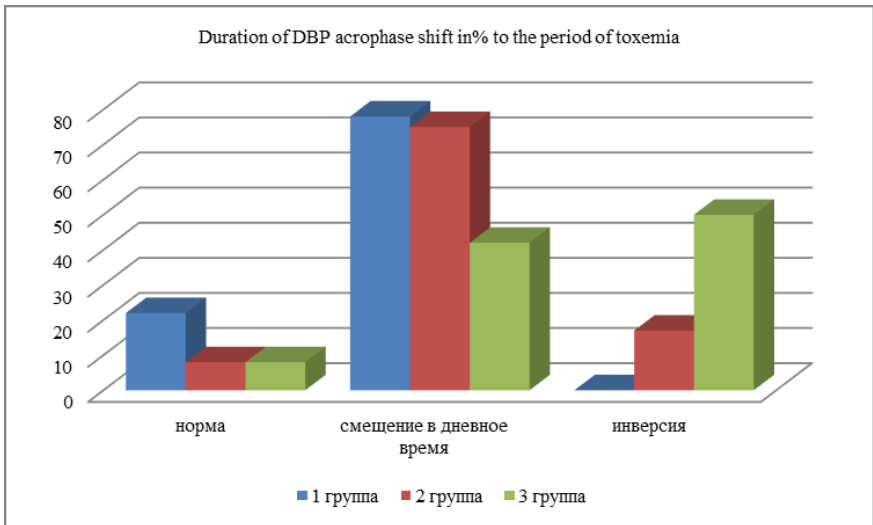


Fig.7

**Fig.8**

Conclusions. The more severe the injury, the greater the daily range of fluctuations in SBP, DBP on the first day. The general tendency to an increase in the mesor of the circadian rhythm SBP and DBP on days 8 and 9 in group 1 can be explained by a decrease in stress-limiting drug correction in the process of preparation for transfer from ICU. The increase in the mesor of the DBP on days 10, 17 in children of group 3 was most likely due to a decrease in the effectiveness of stress-limiting therapy against the background of an exacerbation of the systemic inflammatory response caused by insufficient effectiveness of antibacterial, anti-inflammatory therapy in conditions of thermal damage to the skin surface 2-3A degree $25.8 \pm 11.4\%$, 3B degree $22.5 \pm 6.6\%$ and IF 95.8 ± 19.1 units.

The more severe the injury, the more pronounced the increase in amplitude and range, the deformation of the phase characteristics of the daily and about weekly periods of SBP and DBP oscillations. The period of toxemia of severe burn injury is characterized by the longest inversion of the circadian rhythm of DBP (over 50% of the period of toxemia) in the most severe patients of group 3.

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**ASSESSMENT OF THE FREQUENCY OF ASSOCIATIONS OF
HERPESVIRUSES AND PARODONTOPATHOGENIC BACTERIA
PORPHYROMONAS GINGIVALIS FOR INFLAMMATORY
PERIODONTAL DISEASES**

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*The importance of herpes viruses as a triggering mechanism of periodontal inflammation has been intensely discussed in recent years, but the relationship with certain types of periodontal pathogenic bacteria remains poorly understood. **Purpose of the work** - establish the frequency and relationship of identification of marker DNA of representatives of the Herpesviridae family and the main periodontopathogenic species - Porphyromonas gingivalis when examining a significant number of patients. Materials and methods. The results of periodontal and laboratory examination of 927 patients of dental clinics aged 18 to 75 years - 493 (53%) women and 434 (46%) men, with inflammatory periodontal diseases (K.05.0 and K.05.3 according to ICD 10) for the period time from 2009 to 2019. Using PCR, samples of biofilm material from the gingival sulcus and periodontal pockets were examined to detect marker DNA of viruses of the Herpesviridae and Porphyromonas gingivalis families. Statistically significant relationships were revealed. **Results and discussion.** In 103 (16%) people with CP, HSV1 and P. gingivalis were detected, in 45 (7%) - only HSV1, in 275 (42%) - P. gingivalis, and in 231 (35%) none of the these types of microbes. 53 (81%) patients had CMV and P. gingivalis DNA in the contents of the periodontal pockets, 12 (2%) - only CMV, 325 (50%) - P. gingivalis and 83 (68%) people had neither CMV nor P. gingivalis ($p=0.000$). Conclusion. In CP patients, a correlation was found between the detection rates of HSV1, CMV, and P. gingivalis. Moreover, it was observed in patients with CPS and CPT, but not in patients with CPL. No correlations were found between HSV1, EBV, and P. gingivalis.*

Keywords: periodontitis, gingivitis, PCR, association, P. gingivalis, Herpesviridae, HSV1,2, CMV, EBV.

Introduction

Studies conducted at the beginning of the century are based on the assumption that members of the herpesvirus (HV) family are involved in the etiopathogenesis of destructive periodontal diseases [5, 6]. In particular, it has been shown that the Epstein-Barr virus (EBV) and cytomegalovirus (CMV) can have a direct cytopathic effect on fibroblasts, keratinocytes and endothelial cells [2]. Some of the herpes-associated cytokines and chemokines are markers of damaged areas of the periodontium [1, 10, 11]. A number of articles have investigated the associations between HV, in particular EBV, and periodontal tissue diseases, including chronic and aggressive periodontitis. However, they were full of controversy regarding their detection in this material. The main drawback of these works was the small sample size, which did not allow for adequate statistical processing.

Therefore, the **purpose** of our work was to establish the frequency and relationship of the detection of marker DNA of representatives of the *Herpesviridae* family and the main periodontopathogenic species, *Porphyromonas gingivalis*, when examining a significant number of patients.

Materials and research methods

The work included 927 people - patients of dental clinics aged 18 to 75 years - 493 (53%) women and 434 (46%) men who underwent a full periodontal examination for inflammatory gum disease for 10 years (from 2009 to 2019 biennium). All patients gave informed consent to conduct clinical and clinical-laboratory examinations. On the basis of inclusion/exclusion criteria, questionnaires of patients and analysis of clinical conclusions (diagnoses) of comparison, taking into account the international classification of diseases ICD 10, patients were randomized into the main groups: acute gingivitis K.05.0, chronic periodontitis K.05.3, as well as by the severity of chronic periodontitis: CPL, CPS, CPT.

According to the survey, only 306 (33%) people indicated a history of infections caused by viruses of the *Herpesviridae* family. Of these, 14 (9%) people with healthy periodontal disease, 49 (40%) people with gingivitis, 48 (35%) CPL patients, 108 (37%) CPS patients and 87 (38%) people with CPT. In the area of the periodontal sulcus (in healthy people) and periodontal pockets (in patients), samples of biofilm material were taken with standard dental applicators (№ 1), which were then examined in the laboratory of Molecular Biological Research of the Scientific Research Medical and Dental Institute of the MSMU. DNA extraction was carried out using a set of

reagents "Sample Preparation Universal" (NPF "Genlab", RF). For the identification and DNA of herpes simplex viruses types 1 and 2 (HSV 1, 2), cytomegalovirus (CMV) and Epstein-Barr virus (EBV) using polymerase chain reaction, followed by electrophoresis in 1.6% agarose gel, a multiplex set of reagents was used "Multiger-3" for identification of CMV, HSV 1, 2 and EBV, as well as "Gerp-2" for identification of HSV type 2 (NPF "Genlab", RF).

Amplification of markers of periodontopathogenic bacteria *Porphyromonas gingivalis* in the same biofilm samples was carried out in a "Tertsik MS-2" thermal cycler ("DNA-technology", Moscow) using a multi-primer PCR kit "Multident-5" (OOO NPF "Genlab"). Amplified DNA samples were analyzed by gel electrophoresis in 1.6% agarose after staining with ethidium bromide [5].

Statistical data processing was carried out using the Statistika 7.0 and BIOSTAT v.4.03 applied software package. The significance of differences between the indicators was determined using the χ^2 criterion and correlation analysis with a given significance level $\alpha=0.05$ and $p \leq 0.05$.

Research results

With the help of molecular genetic studies, variants of the occurrence of viruses of the family *Herpesviridae* (HV) and the leading periodontal pathogenic species *P. gingivalis* in the area of the periodontal sulcus/periodontal pocket of the examined patients were studied.

In the area of the periodontal sulcus, HSV1 DNA was detected in 5 (3%) healthy people, 27 (22%) people with gingivitis, 148 (23%) CP patients (tab. 1). HSV1 DNA was detected in periodontal pockets of 75 (33%) CPT patients. In patients with CPS, it was determined 1.8 times and in patients with CPL - 2.2 times less often. HSV2 was detected in 10 (4%) patients with CPT, 5 (2%) with CPS, and 5 (4%) with gingivitis. CMV DNA was determined in all patient groups: in 2 (1%) healthy people, 9 (7%) people with gingivitis, 11 (8%) patients with CPL, 24 (8%) - CPS, 30 (13%) - CPT, only 65 (10%) patients with CP. EBV was identified in 3 (2%) people with healthy periodontal disease, 29 (24%) people with gingivitis, 167 (26%) CP patients: in 28 (20%) people with CPL, 72 (25%) - with CPS and 67 (30%) - with CPT.

So, in 3% of people with a healthy periodontium, HV DNA was detected, except for HSV2. In patients with inflammatory diseases of the periodontal tissues, most often, in 22% - 25% of cases, HSV1 and EBV were identified, less often HSV2 - in 2% - 4% of cases, and in 7% - 10% of patients - CMV DNA. Most HV was detected in the periodontal pockets of CPT patients, that is, the dependence of the frequency of detection of herpes viruses on the severity of CP was established.

At the same time, when carrying out PCR with primers of periodontal pathogenic bacterial species in the same patients, no person with healthy periodontal disease was found to have *P. gingivalis* DNA, although this type of microbes was detected in 35 (29%) people with gingivitis and 2 times more often - 378 (58%) patients with CP: 64 (46%) people with CPL, 171 (59%) patients with CPS and 143 (63%) people with CPT.

To investigate the possible relationship between the presence of viruses and periodontal pathogenic bacteria *P. gingivalis* in inflammatory diseases of the oral cavity, we compiled a table of contingencies between different species of HV and *P. gingivalis*, as well as in the form of diagrams reflecting possible variants of microbial associations. As shown in tab. 2, no person with a healthy periodontium in the area of the gingival sulcus was simultaneously identified with HSV1 and *P. gingivalis* DNA, although in 5 (3%) people only HSV1 DNA was detected, while *P. gingivalis* in healthy people was not found. In 15 (12%) patients with gingivitis, HSV1 and *P. gingivalis* were simultaneously detected, in 12 (10%) people only HSV1 DNA was detected, in 20 (16%) people - only *P. gingivalis*, in 75 (62%) people were not identified neither HSV1 nor *P. gingivalis*.

In 103 (16%) people with CP, HSV1 and *P. gingivalis* were detected, in 45 (7%) - only HSV1, in 275 (42%) - *P. gingivalis*, and in 231 (35%) none of the these types of microbes. At the same time, HSV1 and *P. gingivalis* were identified in 10 (7%) patients with CPL, in 11 (8%) only HSV1, 54 (39%) - only *P. gingivalis*, and in 63 (46%) neither HSV1, nor *P. gingivalis* ($p=0.901$). However, in 38 (13%) CPS patients and 55 (24%) CPT patients, both HSV1 and *P. gingivalis* were identified simultaneously; in 14 (5%) patients with CPS and 20 (9%) patients with CPT only HSV1 was detected; *P. gingivalis* DNA was detected in 133 (46%) people with CPS and 88 (39%) people with CPT; in 104 (36%) patients with CPS and 64 (28%) with CPT, neither HSV1 nor *P. gingivalis* were detected ($p=0.024$).

It should be noted that CP (fig. 1) showed an increase in the number of people by 1.8 times, depending on the severity of periodontitis ($\chi^2=13.4$, $p=0.001$), in whom HSV1 and *P. gingivalis* were simultaneously determined. But in patients with CPS, *P. gingivalis* was detected statistically more often 1.2 times outside the association with HSV1, but only HSV1 was 1.8 less frequently than in patients with CPL and CPT ($\chi^2=25.9$, $p=0.000$).

The second representative of HV for which a correlation with *P. gingivalis* was shown was CMV, although it was less common than HSV1. Analysis of the associations of CMV and *P. gingivalis* in patients with gingivitis showed that 6 (5%) people had these types of microbes simultaneously, 3 (3%) people only CMV, but not *P. gingivalis*, and 29 (24%) people - *P.*

gingivalis, but not CMV, and in 83 (68%) neither CMV nor *P. gingivalis* were detected at $p=0.011$ (tab. 2). At CP 53 (81%) patients had CMV and *P. gingivalis* DNA in the contents of the periodontal pockets, 12 (2%) - only CMV, 325 (50%) - *P. gingivalis*, and 83 (68%) people had neither CMV, nor *P. gingivalis* ($p=0.000$). Therefore, in CP patients, a correlation was also observed between CMV and *P. gingivalis* (fig. 2). Moreover, it was observed in patients with CPS and CPT, but not in patients with CPL.

No correlation was found between EBV and *P. gingivalis*. Although it was found that these types of microbes were simultaneously identified in patients with CPS and CPT 3.8 times more often than in patients with CPL ($\chi^2=7.29$, $p=0.026$, $\eta=2$). No significant relationship was found between HSV2 and *P. gingivalis*.

The discussion of the results

Some studies have reported that with a high prevalence of EBV DNA detection, the risk of periodontal disease increases significantly; while other authors noted weak or even lack of associations between them. Further, it was found that human HV are associated with the etiology of periodontitis, since only the activity of bacteria cannot explain all the clinical manifestations of periodontal tissue diseases [4, 7, 8].

Active herpes infection can initiate damage to periodontal tissues and participate in the development of recurrence of the disease. Apparently, all considered herpes viruses induce the release of proinflammatory cytokines that activate osteoclasts and matrix metalloproteinases, as well as disrupt antibacterial immune mechanisms, which leads to a progressive increase in periodontal pathogenic bacteria both in the biofilm and in periodontal tissues.

On the other hand, there are studies in which, using electron microscopy, it is shown that *P. gingivalis*, which are intracellular parasites, can be "conductors of viruses into cells. The interaction between HV and bacteria is probably bi-directional with the participation of bacterial enzymes or other inflammation-inducing factors that have the potential to activate HV in the periodontium [3]. When infected with mouse CMV and *P. gingivalis*, a higher mortality rate was observed in experimental mice than animals infected with mouse CMV and *Escherichia coli*. The ability of *P. gingivalis* to suppress the host's antiviral interferon-gamma responses may partially explain the increased pathogenicity of CMV [9]. Obviously, it can be assumed that HV, when coinfecting with periodontal pathogenic bacteria, create conditions for the development of periodontitis and, conversely, periodontal pathogenic bacteria may depend on the presence of a virus for the initiation and progression of at least some variants of inflammatory periodontal diseases [9, 10].

Conclusion

In CP patients, a correlation was found between the detection rates of HSV1, CMV, and *P. gingivalis*. Moreover, it was observed in patients with CPS and CPT, but not in patients with CPL. In patients with gingivitis, a direct correlation was also established only between the isolation of HSV1 and *P. gingivalis*. No correlations were found between HSV1, EBV, and *P. gingivalis* in CPL and gingivitis.

Table 1

The frequency of DNA detection of the studied microbiota species in the area of the periodontal sulcus, n (%).

Group		ControlN=151	GingivitisN=122	CP N=654	χ^2	η	p
Variable	+	5(3,3)	27(22,1)	148(22,6)	54,2	5	0,00
	-	146(96,7)	95(77,9)	506(77,4)			
HSV2	+	0 (0)	5 (4,1)	15(2,3)	14,2	5	0,016
	-	151(100)	117(95,9)	639(97,7)			
CMV	+	2(1,3)	9 (7,4)	65(9,9)	17,4	5	0,004
	-	149 (98,7)	113(92,6)	589(90,4)			
EBV	+	3(2,0)	29(24,0)	167(25,5)	34,7	5	0,000
	-	148(98,0)	93(76,0)	487(74,5)			
<i>P. gingivalis</i>	+	0(0)	35(28,7)	378(57,8)	215	5	0,000
	-	151(100)	87(71,3)	276(42,2)			

Table 2

Detection rate of HSV1 and *P. gingivalis* (n,%)

Group	Kind	HSV1				χ^2	p
	Pg	+	%	-	%		
control	+	0	0	0	0	0,03	0,8532
	-	5	3,3	146	96,7		
gingivitis	+	15	12,3	20	16,4	12,23	0,0005*
	-	12	9,8	75	61,5		
CPL	+	10	7,2	54	39,1	0,02	0,9013
	-	11	8	63	45,7		
CPS	+	38	13,2	133	46	5,08	0,0240*
	-	14	4,8	104	36		
CPT	+	55	24,2	88	38,8	5,13	0,0235*
	-	20	8,8	64	28,2		

CP	+	103	15,7	275	42	10,91	0,0010*
	-	45	6,9	231	35,3		



Fig. 1. Associations of HSV1 and *P. gingivalis* in people with healthy periodontal disease and patients with various forms of inflammatory diseases of periodontal tissues.



Fig. 2. Associations of CMV and *P. gingivalis* in people with

healthy periodontal disease and in patients with various forms of inflammatory diseases of periodontal tissues**References**

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EFFECTS OF SHEAR STRESS RELATED TO HIFU EXPOSURE IN EXPERIMENT

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High-intensity focused ultrasound therapy (HIFU) has become a serious alternative to a surgical treatment. The therapeutic effect of HIFU is based on two processes generated by the acoustic wave of the emitter: thermal ablation associated with thermal destruction of the affected tissue, and mechanical shifts that initiate the effects of acoustic cavitation and vortex microflows. But it is the kinetic effects that seem to be insufficiently studied phenomena. In order to study the mechanical processes generated by HIFU, experimental studies were carried out on biological objects, which demonstrated that after ultrasound exposure, the amount of glycogen clumps in the liver sharply decreases, and single scattered tumor cells are found on the periphery of the tumor tissue. Thus, acoustic waves refracting in biological tissues generate mechanical effects that can cause a decrease in glycogen clumps in hepatocytes and detachment of tumor cells from the maternal tumor.

Keywords: high-intensity focused ultrasound, experiment, shift stress, thermal ablation, mechanical shifts, thermal destruction, tumor cells, wave microflows, acoustic waves, acoustic cavitation, shock waves

Introduction

In recent years, high-intensity focused ultrasound therapy (HIFU) has become a serious alternative to surgical treatment in oncology and is actively used in the treatment of benign and malignant neoplasms of the

liver, mammary glands, prostate, connective tissue, kidneys, brain and other organs [1, 2].

The HIFU method has a number of significant advantages, namely: non-invasiveness, repeatability to achieve a positive clinical effect, the absence of post-procedural changes in healthy tissues, which significantly reduces the amount of surgical and anesthetic risk [1,3]. The energy of an acoustic wave generated by a focused ultrasonic emitter, propagating in inhomogeneous biological tissues, partly turns into heat, and partly is transmitted in the form of a mechanical impulse [4].

The therapeutic effect is based on thermal destruction; the role of a mechanical impulse generating acoustic currents is practically not taken into account. But the velocity gradient in a heterogeneous biological environment can reach significant values. In particular, at a HIFU intensity of 8.2 kW / cm² and a frequency of 1.4 MHz, the rate gradients reach 10⁷ ... 10⁹ s⁻¹ and are more than enough for rupture of cell membranes, disruption of intercellular and intracellular structures, and large molecules. Another source of mechanical microflows is pulsating cavitation bubbles. The limiting microflow velocity near the pulsating bubble can be estimated based on the equation:

$$v = U^2 / \omega \alpha, \text{ where}$$

v - the limiting speed of the microflow;

U - is the radial velocity of the bubble boundary;

$\omega = 2\pi f$ - circular frequency;

α is the average bubble radius.

Considering the importance of vortex flows, the aim of the study was to analyze mechano-associated biological effects arising from HIFU-induced exposure.

Materials and methods

The objects of the study were 19 sexually mature male Wistar rats weighing 286.0 ± 3.8 g. The experiments were carried out in accordance with the "Guidelines for using laboratory animals for scientific and educational purposes at the Pavlov First Saint Petersburg State Medical University", drawn up on the basis of the Directive of the European Parliament and the Council of the European Union 2010/63/EU of September 22, 2010 on the protection animals used for scientific purposes. The animals were on unlimited consumption of standard food K-120 ("Inform-korm", Russia) and water, the light regime was changed every 12 hours. The rats were kept in 4 rats in a plastic cage in a ventilated room at an air temperature in the range of 22–25 °C, relative humidity - 50–70%.

The duration of the quarantine was 14 days. The animals were divided into two groups, ten of them were subcutaneously inoculated with the cell homogenate of Pliss lymphosarcoma (strain from the N.N. Petrov Research Institute of Oncology, Ministry of Health of the Russian Federation). Transplantation of a solid strain of Pliss's lymphosarcoma was performed under aseptic conditions subcutaneously in the right thigh area. A 10% suspension of cells in 0.9% sterile sodium chloride solution was introduced in a volume of 0.2 ml.

Measurement of the size of Pliss lymphosarcoma was carried out at intervals of 2-3 days within 15 days from the moment of inoculation. After the tumor reached a certain size, the animals were anesthetized by intravenous administration of Zoletil 50 (VIRBAC, France) and Xila (Interchemie werken "De Adelaar BV", Netherlands) in equal volumes at a dose of 0.5 ml / kg and placed on a thermostatted TCAT-2 table Temperature Controller (Physitemp, USA), with constant maintenance of rectal temperature in the range of 37.0-37.8 ° C. Subsequently, the animals were exposed to high-intensity ultrasound using an N-148 S \ N 010 emitter in the following mode: frequency 1.4 MHz, intensity 8.2 kW / cm², exposure 300 ms. The surface of the tumor was preliminarily covered with a viscous gel "Aquagel".

Another group of anesthetized animals (9 rats) performed a midline laparotomy under the control of vital functions. A rubber retractor was inserted into the operating wound and the ribs were moved to the sides, increasing the transverse size of the operating field with subsequent removal of the liver into the operating wound. Next, the most accessible surface of the liver was visually examined to exclude lesions and carry out subsequent manipulations. During preparation, the surface of the liver was constantly irrigated with a warm isotonic solution of 0.9% sodium chloride, which prevented the rapid drying of the surface of the parenchymal organ.

The selected area of HIFU irradiation in the following mode: frequency 1.4 MHz, intensity 8.2 kW per cm² in an averaged focal spot 0.6 mm in diameter, exposure 400 ms. The zone of thermal injury was located at a depth of 1.0-1.5 mm from the liver surface. The surface of the parenchymal organ was covered with a viscous gel "Aquagel" for the passage of acoustic vibrations.

The effectiveness of ultrasonic exposure was assessed using a Seek Thermal Comhact PRO mobile thermal imaging camera for Android with micro-USB (Seek Thermal, USA).

Immediately after the end of the experiment, a biopsy sample was taken

from the animals near the thermal destruction and a histological study was performed. Subsequently, biopsies taken from the liver were fixed in a FAA (formalin-acetic acid- alcohol) solution. Samples were stained with a PAS stain to detect glycogen. A significant decrease in glycogen in the liver compared to the control was noted. The sinusoidal capillaries of the liver were moderately dilated (Fig. 1).

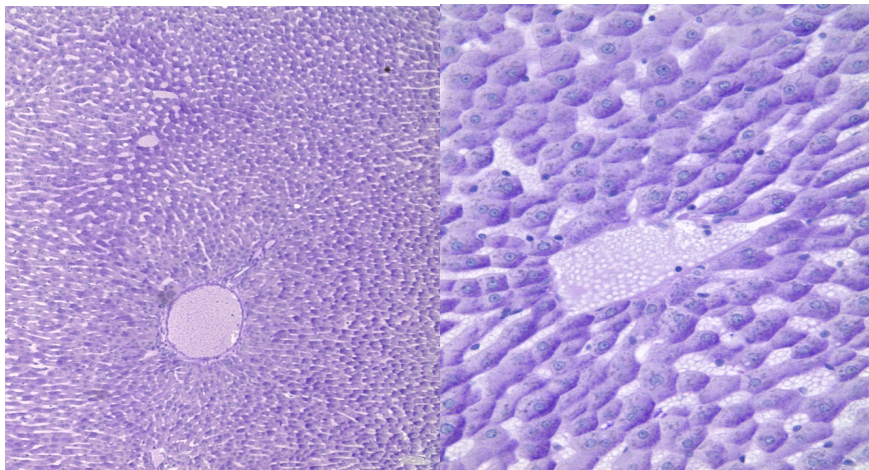


Fig. 1. Histochemical preparation of rat liver near the zone of direct HIFU-induced exposure. PIC reaction with hematoxylin. x10 ocular, x10 objective, (a); x10 ocular, x40 objective (b).

The study of histological preparations from tumor tissue near the focal zone by the method of light microscopy showed that the tumor is a cluster of densely located and irregular tissues with clear boundaries. The nuclei are moderately hyperchromatic and a narrow rim of highly basophilic cytoplasm. In some areas, tumor cells are highly scattered, the space between them is filled with a structureless eosinophilic mass. There are separate round or oval cavities without content in the tumor tissue. In the stroma, vascular congestion, moderate edema and hemorrhage are observed. In the tissue, bundles of edematous striated muscle fibers are found, some of which are necrotic. Various types of connective tissue blood cells are represented inside the tissue. At the surface of the tumor, as well as outside it, a small number of scattered tumor cells are found in the connective tissue (Fig. 2).

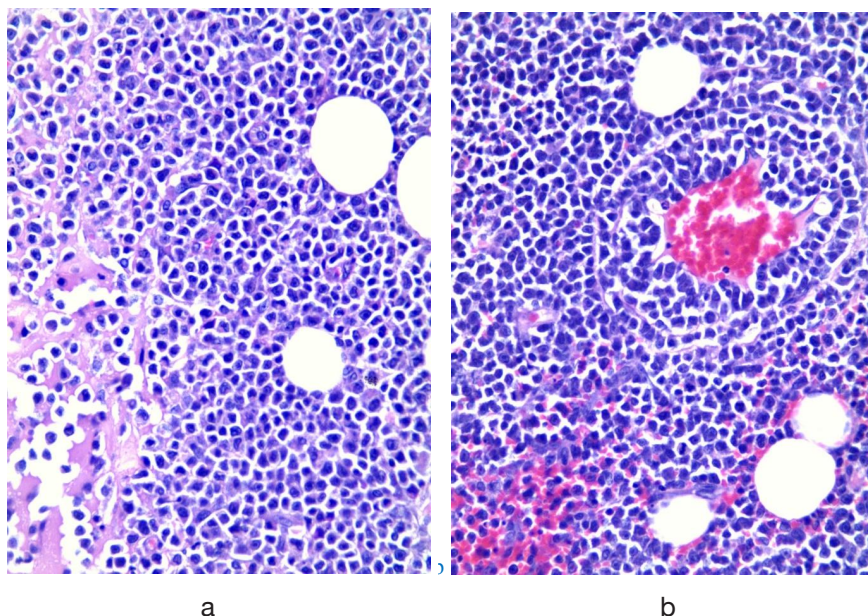


Fig. 2. Pliss transplanted lymphosarcoma after ultrasound exposure. a - central zone, b - peripheral zone. Staining with hematoxylin and eosin. x40 objective, x10 ocular

Discussion

A decrease in the number of glycogen granules in liver cells and scattered tumor cells outside the tumor tissue indicate the importance of ultrasonic microflows generated by high-intensity focused ultrasound.

The propagation of HIFU in heterogeneous tissues of living organisms forms acoustics in the form of a set of spatial and temporal characteristics of mechanical disturbance with the formation of interference maxima in local indices of superposition of acoustic waves from external ultrasonic and internal ones.

Conclusion

It is concluded that the response of biological structures under this influences should be determined both the nature of the energy distribution, the degree of manifestation of wave, nonlinear effects and the characteristics of a high-frequency focused acoustic field. The combined functioning of systems, organs, tissues, cells, subcellular and molecular structures generates its own acoustic field should be borne in mind. It can be assumed that the intrinsic fluctuations of biological structures are not able to form

conditions for the interference of oscillations of biostructures and an external high-frequency acoustic field. The vibrations of molecules can initiate high-frequency acoustic radiation comparable in frequency characteristics to HIFU and generate the phenomenon of superposition of acoustic waves, the role of which is also poorly studied. It is necessary that a more thorough experimental study of this phenomenon should be performed.

It should be noted that acoustic waves appear in the form of kinetic disturbances generating wave microflows that can cause mechanical changes in the cytolemma, cell membranes of tumor cells and also initiate transmembrane "breaks".

The acoustic cavitation can become a source of pressure impulses and shock waves. It is also initiated the processes of detachment of atypical cells.

Thus, the focused ultrasonic vibrations, generating an architecturally complex acoustic field in biological tissues generate thermal and mechanical effects. The reduction of glycogen clumps and detachment of atypical cells from the main tumor indicate the influence of these effects on the formation of a heat pattern and the space-time continuum of vortex microflows in the focus zone and perifocal areas.

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EFFECTIVE TECHNICAL SOLUTIONS FOR CHANNEL REGULATION OF SMALL RIVERS AND CONSTRUCTION OF RECLAMATION WATER INTAKES¹

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The article investigates the problems of regulating sections of small river channels, construction and operation of reclamation water intakes. The substantiation of the effectiveness of the use of environmental technologies for the design and construction of protective and regulatory and water intake structures is given. Many water intake and protective structures built on small rivers are in an unsatisfactory operational condition and need improvement and complete reconstruction. Analytical and field studies were carried out on the head structures of the foothill reclamation systems, on the basis of which the reasons for the low efficiency and reliability of the old water intake structures and protective and regulatory structures in operation were revealed. For reclamation purposes, new types of underground horizontal and underflow water intakes and protective structures, author's design, have been proposed. The technical parameters of the efficiency of these water intakes have been determined. The substantiation of the low efficiency, high energy and material consumption of the existing water intake and protective and regulatory structures is made. And also - the need to significantly reduce the cost of the supplied irrigation water through the introduction of new types of highly efficient water intake structures. The alluvial regimes of

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ivers, sedimentation tanks and hydraulic regimes of the head water intake structures have been investigated. Based on the results of the research, constructive and technological solutions have been prepared that help to effectively combat sediment, increase the water intake coefficient and regulate water supply to irrigation canals. In the future, technical conditions and projects of standard structures for water intake and protective and regulatory structures for small reclamation systems of coastal zones will be developed.

Keywords: water intake structures, reclamation systems, under-channel water intake, water intake devices, horizontal water intake, protective and regulatory structures, biopositive structures.

The problems of engineering protection and environmental management of river coastal zones are relevant in many countries of the world [1, 2, 3]. In our country, especially in the South of Russia, these problems have become acute.

The entire territory of the regions of the South of Russia and the North Caucasus is cut by the channels of small and medium rivers, while the main infrastructure of the regions is concentrated in the coastal zones. River basins with adjacent natural areas are known to form the basic structure of their ecosystem. If the rivers are clean and their natural regime is not disturbed, then, as a rule, the adjacent territory is clean and the entire ecosystem of the territory functions normally (the cycle of water, substances, energy is ensured, the biodiversity of fauna and flora is observed, etc.). However, the experience of recent decades shows the opposite, i.e. most of the land in the basins and coastal zones of small rivers is polluted and needs environmental protection and land reclamation - to improve and restore disturbed areas.

The main hydrographic network of the North Caucasus (NC) is formed by basins of relatively large rivers: Terek, Kuban, Kuma, Sulak and Samur with their numerous tributaries belonging to small rivers. They are characterized by sharply increasing floods, high speed and alluvial regimes, erosion and transport capabilities. These rivers flow through the mountainous, foothill and plain areas of the NC regions, and the main infrastructure of the region is concentrated along their coastal zones. For example, in the basin of the Terek river with its small tributaries there are about 100 water facilities, including reservoir and water intake waterworks, hydroelectric power plants, irrigation and water supply systems, regulated sections of rivers, etc. Moreover, all these objects (for the most part) are water consumers operating independently of each other and according to their

narrow departmental rules. There is no single ecological infrastructure that would ensure the efficient and rational use of water and land resources of the Terek river basin, as well as the preservation and restoration of its biological resources [4, 5, 6]. Within the individual republics, unified water management systems and environmental infrastructures for the effective management and protection of floodplain and coastal lands have not been formed either. At the same time, most of the industrial and social facilities of the NC republics are located in coastal water protection areas.

The most vulnerable were the coastal urbanized zones of small rivers, where rapid human economic activity turned them into man-made zones with disturbed hydrological regimes and ecosystems. Thus, the need arose for the environmental regulation of these river sections.

Protective and regulatory structures are the most widespread and longest structures used to regulate river sections and protect coastal lands. At the same time, protective and regulatory structures, occupying a large area of water protection zones and interacting with water flows and basins, have a significant impact on their ecosystems. The current established experience in the design, construction and operation of these structures shows that negative experience largely prevails, showing their technogenic impact on the natural environment [6].

The authors have developed an effective method for regulating the channel and coastal zones with the help of short half-dams-bays, arranged in the base (along the bottom slopes) of the optimal section. At the level of inventions, a number of biopositive constructions of half-dams of bays, coastal and slope fastenings, and technologies for their construction have been developed [7, 8]. Many of them have undergone experimental studies in many river sections, where they have shown themselves to be effective and reliable.

On the regulated sections of rivers using environmentally efficient technologies, environmentally safe and reliable water intake structures are also required to ensure the water demand of the coastal reclaimed lands. However, the established practice of construction and operation of water intake facilities shows that they need to be improved and adapted to the river regime. Many water intake facilities, built on small rivers during the Soviet era, are characterized by very low operating efficiency, are in an unsatisfactory operational condition, and require complete reconstruction. These problems were especially acute in the conditions of irrigation systems in the foothill zones, where the alluvial regimes of small rivers have a significant impact on the efficiency of water intake devices and structures. As part of such water intake structures, expensive washing devices and

sedimentation tanks are provided, which violate the regime of rivers, require large material and energy costs. In this connection, the prime cost of irrigation water for many farms has become unmanageable, and operating costs do not pay off economically at all. Therefore, the Soviet system of free supply of irrigation water to consumers has survived to this day. The costs of operating organizations are covered by budgetary allocations, and this, in turn, leads to a violation of the regime of rivers and fish migration zones, as well as to irrational use of water resources [9, 10, 11].

Retention of budgetary financing for land reclamation systems cannot be sustained for a long time; at present, a system of partial compensation by farms (water consumers) of operating organizations' costs is being introduced. As the market infrastructure develops, in order to fully move into economically viable relations with farms in the future. For this, first of all, it is necessary to sharply reduce the cost of the supplied irrigation water.

Thus, the need arose, along with environmentally friendly technologies for regulating river sections, and in completely new types and designs of water intake structures, which would ensure the intake and supply of the required quantity and quality of irrigation water with minimal material and energy costs. For this purpose, in many respects, underground horizontal and underflow intake structures of a combined design are suitable [8, 9, 11].

In the known and applied technical solutions for the design and construction of protective and regulatory and water intake structures, technogenic approaches prevail, which do not take into account the peculiarities of small rivers, their alluvial and speed modes, technological conditions of operation of water intakes, energy consumption of regulating devices of water intake and washers. In this connection, the authors have developed more efficient constructive and technological solutions for protective and regulatory structures, as well as for underground horizontal and under-channel water intakes. For this, the problems of operational reliability and efficiency of the existing water intake waterworks of small rivers in the foothill zones were first studied. More detailed field and analytical studies were carried out on the foothill regulated areas of small rivers with water intake structures of the KBR irrigation systems located on the Chegem, Baksan and Cherek rivers:

- the alluvial regimes of rivers, the efficiency of the work of water intakes, washers and sedimentation tanks of the head water intake structures were investigated;
- effective design and technological solutions have been developed

for the design of horizontal and underflow intake structures of combined structures (some of them are protected by patents for inventions, and the honor is under consideration).

- efficient and biopositive designs of protective and regulatory structures and slope fixings for regulated sections of small rivers have been developed.

Since 1995 the authors have carried out the above-described research and development. Based on the results, new designs and technologies for the construction of bank protection and channel-regulating structures, underground horizontal and under-channel water intake structures for small reclamation systems were developed and proposed.

Under the leadership of S. O. Kurbanov, a scientific direction in the field of land reclamation and water management "Development of the theory of methods of calculation substantiation and design of canals and regulated channels of polygonal profile" is being developed. He developed methods for regulating small sections of small rivers and models for the computational justification of polygonal channels in the conditions of foothill zones [9]. Within the framework of this area of research, a number of options for new design and technological solutions for the design and construction of horizontal and underflow filtering water intake structures and protective and regulatory structures of a biopositive design with the maximum use of local and safe artificial materials [12, 13-20]. There are developed ecological methods for regulating sections of river channels, where new types of water intake structures are being designed. In the construction of new water intakes and protective fastenings, products made from natural materials (light and heavy fascines, etc.) are used to a large extent, which have a beneficial effect on river flow and coastal green zones.

The results of the research carried out confirm that the majority of reclamation water intake (dam and non-dam) and protective and regulatory structures used in practice are environmentally hazardous, energy-intensive and material-intensive. Therefore, they do not allow land reclamation systems to fully transform into economically viable relations with farms - water consumers.

Below are some of the author's technical solutions for underground horizontal and under-channel water intakes of a combined design and protective and regulatory structures.

Fig. 1. shows the diagrams of underground horizontal water intake of the combined structure, where fig. 1 shows a longitudinal section of the main section of the horizontal water intake; fig. 2 - the same in plan; fig. 3 - a cross-section of the water intake [12]. The underground

horizontal water intake consists of a water intake trench 1, gabion mattresses 2 with drainage devices made of light fascines 3 and perforated pipes 4, laid in layers and wrapped in a gabion net. On top of the gabion mattresses in 2 longitudinal rows are laid flexible mattresses 5, made of light fascines 3, wrapped in a geogrid. In the mouth of the trench 1, a rigid tray 6 of rectangular cross-section is arranged, laid along the slope of the trench with a cantilever entrance to the catchment well 7. For water intake from the well 7, a suction pipeline is arranged 8. Light fascines 3 are made from ripe reeds.

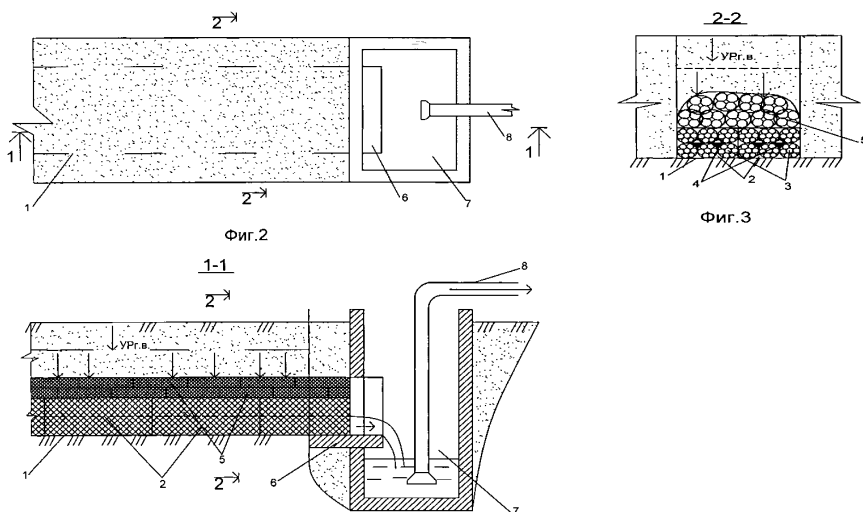


Figure 1 - Horizontal water intake of a combined design

Underground horizontal water intake of a combined design can be most effectively used in coastal and floodplain areas of small rivers with a depth of groundwater level up to 7 m. In terms of material costs and impact on the natural environment, water intake is economically efficient and environmentally safe.

Fig. 2 shows the diagrams of the underflow filtering water intake of the combined structure, where figure 1 shows a section of the structure along the longitudinal axis of the drainage gallery; in fig. 2 - water intake section in the plan; figure 3 is a cross-section of the structure along the axis of the tubular water intake; in fig. 4 - flexible mattress; in fig. 5 is a fragment of a perforated pipe with stiffeners [13].

The water intake consists of a drainage gallery 1 and a water intake made of a metal grate 2 and flexible mattresses 3, stacked in two rows on top of the grate. In the first row 4 flexible mattresses 3 are tightly packed along the entire width of the gallery and in the direction of its longitudinal axis, and the second row 5 - across the gallery and in the direction of the surface water flow. At the same time, the second row of 5 mattresses is laid with a slope and a greater length that overlaps the width of the drainage gallery 1 on both sides.

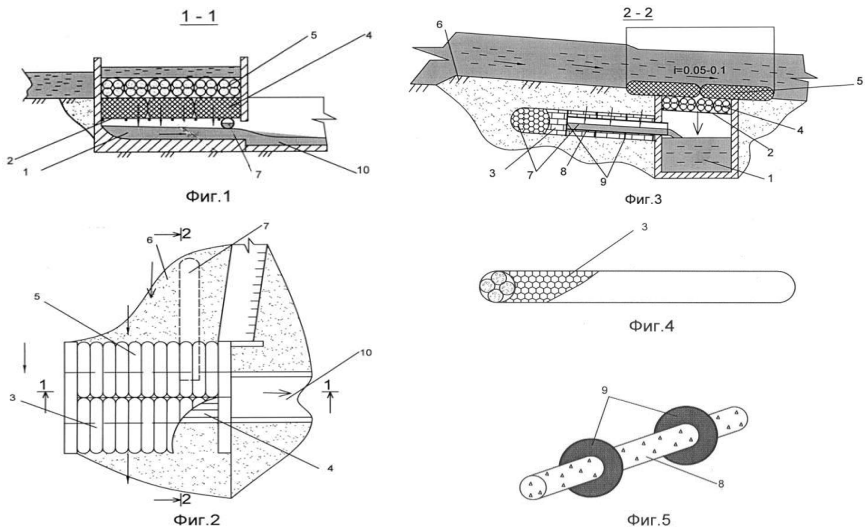


Figure 2 - Underflow filtering water intake of combined design

In the headwater, in front of the water intake mattresses 3, a guide sill 6 is provided. At a depth under the sill 6 in the direction of the channel, a tubular water intake 7 is arranged, the end part of which enters the drainage gallery 1 at the water's edge with a slope. The tubular water intake consists of perforated pipes 8, flexible mattresses 3 and rigid ribs 9. At the end of the drainage gallery, a discharge channel 10 is arranged.

The under-channel water intake can be most effectively used in the foothill and mountainous areas of small rivers, characterized by high alluvial and high-speed regimes. Material consumption and energy consumption of water intake is 50% lower compared to other types of water intake.

There is also a number of similar author's developments on water intake facilities, confirmed by patents for inventions [14, 15] and prepared for filing for obtaining new patents. The structures of water intakes and technologies for their construction are biopositive, contribute to the preservation of the natural regime of rivers with hydro-biological conditions. The introduction and use of these water intakes for supplying water to the ameliorative irrigation systems of the foothill zones gives a significant economic effect. They do without reclamation sedimentation tanks, energy costs are reduced by more than 2 times, and the prime cost of supplied irrigation water is reduced by 40% or more.

Fig. 3 shows diagrams of coastal fastening made of fascines and gabion mattresses of a biopositive design, where fig. 1 shows a cross-section of a coastal protection structure with coastal anchorage; fig. 2 - plan of the site for fixing the biopositive structure; fig. 3 - reinforcing lattice cage; fig. 4 - heavy fascine [16].

The coastal anchorage contains a coastal slope 2, consisting of layered rows of light and heavy fascines. Heavy fascines 1 are laid in longitudinal and transverse stripes with the formation of square or rectangular cells, of various sizes from 1 to 2.5 m. Heavy fascines 1 are interconnected with the help of metal stainless meshes and wires. Inside the cells, a polymer mesh 4 is laid in the base and attached to heavy fascines 1, on top of which light fascines 3 are stacked in one layer in dense rows, covered from above with a gabion mesh 5. Additionally, in the base of the slope 2, at a certain distance from each other, gabion mattresses 6 of a prismatic shape are arranged and attached to the heavy fascines 1 of the slope attachment. Above the gabion mattresses 6, a reinforcing lattice frame 8 of a segment shape is arranged and attached to rectangular rings 9 wrapped around the gabion mattresses 6 at a distance from each other. Reinforcement cage 8 with the help of cables or reinforcing wires 10 is attached in places to the anchors 11, which are arranged in the slope 2 above the attachment and at a distance from each other.

The coastal fastening is intended for engineering and environmental protection of coastal regulated sections of rivers in their foothill and flat areas, where the average speed of flood flows does not exceed 2.5-3.0 m/s. It can be most effectively used in hard-to-reach areas of small rivers, where water intake waterworks are set up.

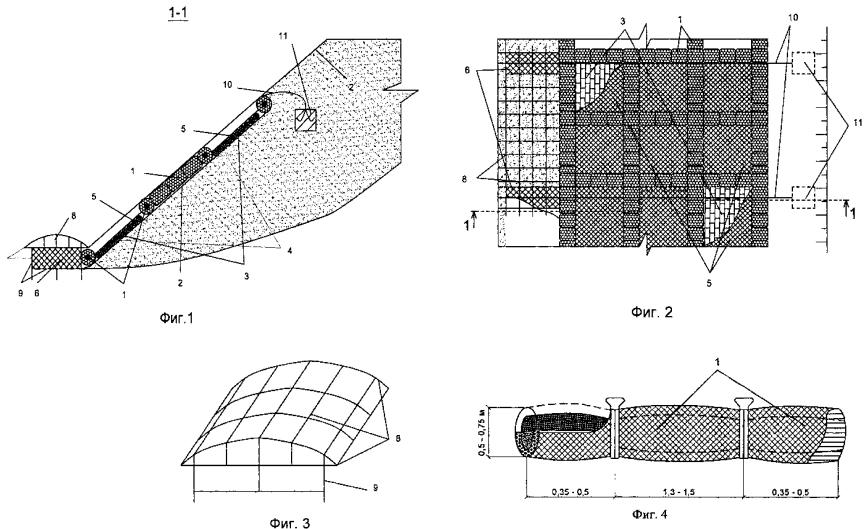


Figure 3 – Coastal fastening from fascin biopositive construction

There is also a number of similar author's developments on protective and regulatory structures, confirmed by patents for inventions [17, 18-20] and prepared for filing for obtaining new patents. Plans of structures and technologies of their construction are biopositive, create favorable conditions for fish spawning and germination of green plants in coastal slopes. In terms of material costs and impact on the natural environment, these structures are ecologically efficient and economically beneficial.

Currently, the authors are developing technical documentation for the implementation of the proposed structures for reclamation water intake and protective and regulatory structures within the framework of the state grant program.

Conclusions

1. The results of the conducted research and scientific analysis of materials of operating experience, reliability and efficiency of the water intake and protective and regulatory structures of the reclamation systems of coastal zones show that:

- existing and applied in practice structures of reclamation systems in foothill zones are characterized by high energy and material consumption and low efficiency;
- there was a need for more efficient designs of protective and regulatory, underflow and damless water intake structures.

2. On the basis of the research carried out, new constructive and technological solutions have been developed for the construction of protective and regulatory, horizontal and underflow intakes, for which more than 20 patents for inventions have been obtained.

3. The main characteristics that confirm the reliability and efficiency of the proposed structures are low material consumption, efficiency, environmental friendliness, reliability and manufacturability of construction.

In conclusion, based on the results of the research, scientifically grounded recommendations and technical conditions will be developed for the design and construction of environmentally efficient structures of protective, regulatory and water intake structures for small irrigation systems in foothill zones. The results of the work during their implementation will increase the efficiency of the design and construction and environmental protection measures, as well as significantly reduce the use of man-made structures in practice.

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EXPERTISE OF THE SELECTION OF CROSS-SECTIONS OF HIGH-VOLTAGE OVERHEAD LINES

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The paper presents material related to some aspects of the examination of existing technical solutions for the selection of cross-sections of high-voltage overhead power transmission lines of alternating current. Two new formulas for calculating conductor cross-sections are proposed. A classification of the recommended methods for selecting the cross-section of high-voltage overhead power transmission lines of alternating current depending on the voltage class of these lines has been developed. The essence of the concept of the economic cross-section of a conductor is briefly described.

Keywords: examination, wire cross-section, overhead power lines, conductor cross-section selection, high-voltage lines, electrical networks, conductor economic cross-section.

Introduction

The proposed work examines the material related to issues related to some aspects of the examination of the selection of cross-sections of high-voltage overhead power transmission lines (HV PTL) of alternating current. The term "cross-section selection" is more correct than the term "cross-section calculation", since the conductor cross-section is selected from the known standard cross-section values using technical reference literature and on the basis of preliminary engineering calculations. In the article, the words "conductor" and "electrical network" are used as synonyms for the term "HV PTL". Cable transmission lines, low voltage electrical networks and DC lines are not the subject of this article. Also, the work does not analyze the existing methods for selecting the cross-section of conductors, since they are described in detail in numerous textbooks on electrical networks and in scientific articles. The work has nothing to

do with calculating the cross-sections of conductors using software systems, and is focused only on calculations using a conventional calculator. The topic of work concerning the most important parameter of the power transmission line - the cross-section of the wires, is relevant, since the incorrectly selected cross-section of HV PTL, when a number of influencing factors is not taken into account, entails negative consequences, namely: a) overheating of wires, b) premature failure of the line under the influence of wind and ice, c) corona discharge, d) significant electromagnetic interference, e) acoustic noise, f) additional losses of electricity [3, p. 33].

Purpose of the work – synthesis of scientific developments on the selection of the HV PTL cross-section, and adaptation of this synthesis to the examination of the calculation of these cross-sections. *Research objectives* – determination of the compliance of methods for calculating the cross-section of conductors with the voltage class of the electrical network, development of new formulas for calculating the cross-section of conductors. *Credibility* of the results of the study, in particular, the new proposed formulas, is determined by comparing the results of calculations using the new proposed formulas with the results of calculations using the known formulas. *The object* of research is AC HV PTL. *The subject* of the research is an examination of the selection of conductor cross-sections. As a means to achieve this goal, the author used the following well-known *methods* of scientific research: procedures for idealization and abstraction, as well as universal methods of cognition - analogy and comparison, analysis and synthesis, induction and deduction, the method of formalization. *Scientific novelty*: 1) two new formulas for calculating the cross-section of the conductor and its economic cross-section for the voltage loss in HV PTL was developed; 2) a table of recommended methods for selecting the HV PTL cross-section was developed depending on the voltage class of the electrical network.

1. Classification of the recommended methods for selecting the cross-section of high-voltage overhead power lines of alternating current, depending on the voltage class of the electrical network

The classification presented below in the form of Table 1 of the recommended methods for selecting the cross-section of high-voltage overhead power transmission lines of alternating current, depending on the voltage class of the electrical network, was developed by the author based on the synthesis of many literary sources that contain these methods. This table covers all voltage classes above 1000 volts. It will help both electrical project designers and experts reviewing such projects.

Table 1. Classification of methods for selecting the cross-sections of high-voltage overhead AC transmission lines depending on the voltage class of the electrical network.

Cross-section selection method	Voltage class	Note	Reference
By economic reasons	All voltages		[1, p.59]
By economic intervals	0,38-10 kV	For rural distribution networks	
	35-500 kV		[4, p. 12]
	35-750 kV		[6, p. 17], [7, p. 37], [8, p. 267]
	≥ 110 kV		[9, p. 73]
By economic current density	0,38-10 kV	For rural distribution networks	
	6-20 kV	At current density values that do not cause voltage deviations at the receivers of electrical energy in excess of the permissible limits, taking into account the applied voltage regulation and reactive power compensation	[6, p. 16-17], [8, p. 266], [10, c. 1.3.32]
	6-750 kV		[7, p. 28]
	10-110 kV	The criterion of the lowest costs for the construction and operation of the electrical network is adopted	
	35 kV	For the countryside. For wires supplying step-down substations 35/6-10 kV with transformers with voltage regulation under load	[10, p. 1.3.30]
	35-110 kV	For rural distribution networks	
	35-500 kV		[4, p. 12], [8, p. 266]
	≤ 220 kV		[11, p. 12-13]
	≤ 500 kV		

By permissible voltage loss	0,38-20 kV	For distribution networks	
	3-35 kV	For distribution and supply networks	
	6 kV	Taking into account the line inductance	
	6-20 kV	The cross-section is checked after its selection according to the economic current density	[6, p. 16-17]
	6-35 kV		[9, p. 73]
	<20 kV	For distribution networks	
	<35 kV	For distribution and supply networks	[12, p. 85]
	≤35 kV	For non-ferrous wires	
By long-term permissible heating	All voltages	The cross-section is checked after it has been selected for economic reasons.	[1, p. 59]
	0,38-20 kV	For distribution networks	
	6-20 kV	The cross-section is checked after its selection according to the economic current density	[6, p. 16-17]
	6-35 kV	The cross-section is checked after its selection for the permissible voltage loss	[9, p. 73]
	≥35 kV	For post-emergency operation	
By thermal resistance	>1 kV	For bare wires. After calculating the short-circuit currents, if these currents are more than 50 kA	[13, p. 4]
By mechanical strength	6-20 kV	The cross-section is checked after its selection according to the economic current density	[6, p. 16-17]

Under the condition of limiting corona losses	≥ 35 kV	Taking into account the average annual density and air temperature at the height of the electrical installation above sea level, the reduced radius of the conductor, as well as the coefficient of non-smoothness of the conductors	[10, c. 1.3.33]
	110 kV		[14, p. 11]
	≥ 110 kV	For laying lines along highways with elevations above 1500 m above sea level	[15, p. 18], [11, p. 12-13], [16, p. 14], [1, p. 59], [2, p. 72]
	220 kV		[14, p. 11]
By technical and economic calculations	≥ 330 kV		[1, p. 44]
	≥ 750 kV		
	1 150 kV		[6, p. 17], [8, p. 267]
Restriction on the level of radio interference	750 kV		[1, p. 59]
	1 150 kV		[1, p. 59]

2. Formulas for the examination of the calculated values of the conductor

Often, electrical experts, checking numerical calculations submitted for examination by designers and included in projects (for electrical networks and systems, power supply of facilities, power plants and substations, relay protection and automation), are forced to make their own assessment of the correctness of the calculated results provided resort to their own verification methods. Such methods are, in particular, the two formulas proposed by the author in table 2, concerning the determination of the numerical values of the cross-section of conductors.

Table 2. Formulas for calculating the cross-section of conductors.

Notable formulas		New formulas
Formula	Reference	
$s = \frac{\rho}{r_0}$	[1, p. 38]	$s = \frac{2.4LI_{\max, rated, pl}\Delta U}{n(P_{trans.s}R_{PL} + Q_{trans.s}X_{PL})}$
$s_{economic} = \frac{10^3 S_{PL.s}}{\sqrt{3} j_{economic} U}$	[2, p. 72]	$s_{economic} = \frac{1.125(P_{trans.s}R_{PL} + Q_{trans.s}X_{PL})s}{L\Delta U}$
Formula notation		
<p>s – cross-section of one wire conductor for each of the three phases of the power line, mm² (120);</p> <p>L – power transmission distance, km (100);</p> <p>$I_{\max, rated, pl}$ – maximum rated current in the power line, A (365.2);</p> <p>ΔU – voltage loss in power lines, kV (9.6);</p> <p>n – the number of wires in each phase of PL, pcs. (3);</p> <p>$P_{trans.s}$ – the active power transmitted from the generators to the power plant high voltage switching substation, excluding losses in power plant step-up transformers, MW (120.1);</p> <p>R_{PL} – the full active impedance of power lines, Ohm (9.3);</p> <p>$Q_{trans.s}$ – the reactive power transmitted from the generators to the power plant high voltage switching substation, excluding losses in power plant step-up transformers, MVar (90.1);</p> <p>X_{PL} – the full inductive impedance of power lines, Ohm (13.3);</p> <p>$s_{economic}$ – the economic cross-section of a <i>three-core</i> wire for each of the three phases of the power line, mm² (332);</p> <p>$S_{PL.s}$ – the apparent power transmitted from the generators to the power plant high voltage switching substation, taking into account the losses in power plant step-up transformers, MVA (139);</p> <p>U – power transmission voltage, kV (220);</p> <p>$j_{economic}$ – economic current density, A/mm² (1.1)</p> <p>ρ – specific electrical resistance of the wire material (for aluminium – 33.3 $\frac{Ohm \times mm^2}{km}$).</p> <p>$r_0$ – linear active resistance of the electric transmission line, $\frac{Ohm}{km}$ (0.28).</p>		

Note to table 2:

1. In parentheses given after the explanation of each parameter, the numerical values from the design example are given [5, p. 7-8, 12-13]. In this example, the proposed mathematical formulas intended for calculating the values of the cross-section of conductors were checked for reliability.

2. As a result of comparing the formulas proposed by the author with the known formulas, the discrepancy in the results of calculations was $\pm 2\%$. This can be verified by substituting the numerical values of the quantities presented in parentheses (see designations) into new and well-known formulas.

3. The essence of the concept of the economic cross-section of the conductor.

When choosing the cross-section of the conductor, on which the cost of electricity depends, one has to make an alternative decision: if the cross-section is increased, then the losses of electricity will decrease, but at the same time, the initial investment for building the network will increase. The cross-section of the electrical network at which the cost of electricity transmission will be minimal is called the economic cross-section. According to the Electrical Installation Rules, the economic cross-section is determined depending on the economic current density. Let's reveal the essence of the economic cross-section of the conductor.

If we assume that in the coordinate plane the ordinate is the cost of annual costs in monetary units, and the abscissa is the conductor cross-section in mm^2 , then the economic cross-section of the HV PTL wire, determined along the abscissa, will be revealed by the intersection of two lines: a) a straight line coming from the origin, and reflecting the direct dependence of the growth in the cost of annual operating costs on the increase in the wire cross-section; b) a hyperbole reflecting the inverse dependence of the decrease in the cost of annual electricity losses on the increase in the wire cross-section. The resulting curve, located above the two named lines, will represent the annual total operating costs and the cost of energy losses. The minimum value of the annual costs on this final curve, determined along the ordinate axis, will correspond to the economic (optimal) cross-section of the conductor.

It should be borne in mind that the cost of annual operating costs consists of depreciation deductions, current repair costs and staff salaries, and the cost of annual electricity losses consists of the cost of the

maximum load losses of active power and the cost of losses in idle mode of the transmission line. The costs associated with the maintenance of the electrical network and the salaries of the personnel serving this network do not affect the choice of the conductor cross-section.

4. Conclusion

The new formulas for calculating the cross-section of the conductor proposed by the author, as well as the classification of the applied methods for choosing the cross-section of the conductor, which he developed will help both designers of electrical objects and experts who verify these projects.

The article is intended for everyone interested in the design of electrical networks and electrical engineering expertise.

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EXPERIMENTAL CREATION AND MODIFICATION OF MULTI-BEAM INTERFERENCE GRADIENT LIGHT FIELD

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We used the set of two plane semi-transparent splitters with the dielectric covering for the generation of multi-beam interference gradient light field. The generation of two-dimensional distribution of interference maximums is observed in the reflected field when the air wedge is located between splitters. The controlling by the spatial distribution of multi-beam interference light field is experimentally investigated.

Keywords: Multi-beam light field, two-dimensional distribution of interference maximums.

Introduction

Multi-beam interference gradient light fields (MIGLF) can be considered as a result of interference between two or more light coherent beams. At present the considerable growth of interest in the multi-beam gradient field is caused by the advanced development of optical fixation for forceps for the manipulation by the nano- and micro-particles (e.g. the organic cell or its components). In the field of opto-electronics and informatics science the use of such multi-beam field is the attractive trend for the parallel transmission and processing of information. Problems of MIGLF's generation as the result of multi-beam interference are insufficiently inves-

tigated and research results are poorly covered in the available literature. In the original paper [1], the authors used the interference between Bessel light beams of higher orders with weak coaxial super-Gaussian, Gaussian, or annular beams for obtaining such MIGLF. These multi-beam fields are formed as a result of decay of wave-front dislocations, and it can be transformed by a small change of intensity, phase, or width of reference beam in the nonlinear optical scheme. Particularly, the phase modulation leads to an axial rotation of interference pattern. The disadvantages of this method are the use of multiplex holographic filter (for the generation of Bessel light beam of higher orders) and the limited capacity of controlling by parameters of multi-beam field (only the axial rotation of interference pattern).

Another method of MIGLF's creation is the use of refracting pyramids with different numbers of refracting planes [2]. In this case the multi-beam interference fields look like intricate patterns of bright and dark spots with certain symmetry properties. Authors used this multi-beam field for the second harmonic generation. MIGLF had the honeycomb structure, with the angle between planes of symmetry of two biprisms being 90 degrees. Because the typical period of honeycomb field is several microns and in fact the intensity of minimums is equal to zero, we deal with the high intensity gradient of the multi-beam field.

The independent rotation of prisms around the optical axis are used for the change of transversal intensity profile. In this case the control of interference maximums shape occurs: the intensity maximums are modified from quasi-circular spot to interference fringes. However, the change of MIGLF's period in a given optical scheme is impossible. This represents a disadvantage of the scheme with two biprisms.

This paper deals with the investigation of features of spatial structure reorganization of multi-beam field in the optical scheme with refracting pyramids [2] in more detail. Also we present the method of the multi-beam field's generation and the technique of efficient controlling by its parameters.

Generation of Multi-Beam Interference Light Fields and the Controlling by its Parameters

As the basic optical element for the generation of interference field we used the set of two plane semi-transparent splitters (STS). Each semi-transparent splitter "СВ-037" (Russian abbreviation) 40mm in diameter and 10mm thick has the reflection factor $r=47\%$, the light-transmission factor $t=53\%$ for the wave band $\lambda=540-650\text{nm}$. Between STS the thin air wedge is located. In the optical scheme (fig.1) the collimated beam

(He-Ne laser $\lambda = 630\text{nm}$) 2.5cm in diameter D is reflected from the set of STS and the four-beam interference is observed in the reflected field. In this case we dealt with two-dimensional distribution of interference maximums (fig.2).

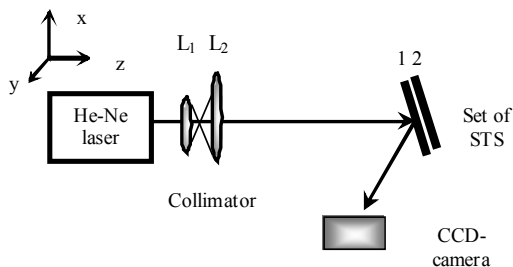


Fig.1. Scheme of the experimental setup with two splitters

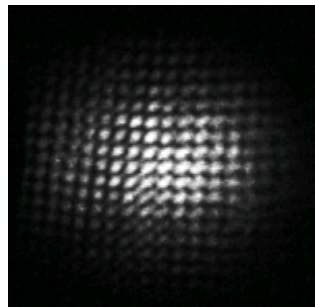
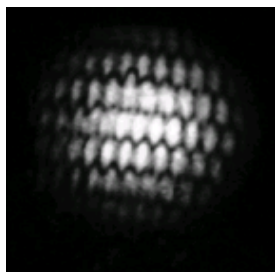


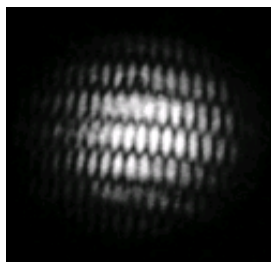
Fig.2. Result of four-beam interference

Fig.2 demonstrates MIGLF's generation similar to the pattern of bright and dark spots having certain symmetry properties in [2]. In this case, interference maximums are located at points of intersection of vertical interference fringes (the reflection from the front semi-transparency splitter 1, fig.1) and horizontal fringes (the reflection from the back splitter 2, fig.1)

The incident angle change Θ is realized by the deflection of STS from the initial position (when the incident angle $\Theta=0\text{deg}$). The angle Θ is varied in the range 6deg – 30deg when the distance between lens L_2 (fig.1) and STS $d=37\text{cm}$. Increasing of the incident angle gives rise to the increase in the number of maximums n along the horizontal direction of interference pattern. Moreover, the maximum thickness decreases (fig.3).



(a)



(b)

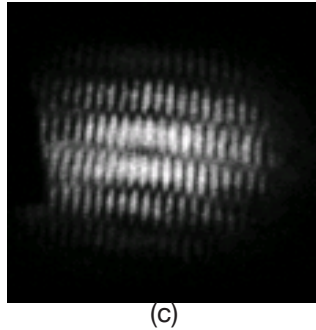
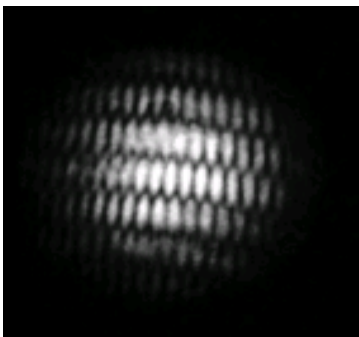


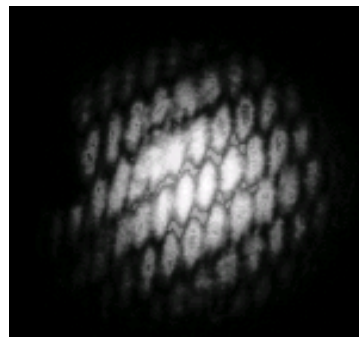
Fig. 3. Result of increasing the incident angle: (a) $\Theta = 10\text{deg}$ and $n = 12$, (b) $\Theta = 14\text{deg}$ and $n=15$, (c) $\Theta = 20\text{deg}$ and $n = 20$

At this situation the decreasing of pattern period along horizontal direction is reached by deflection of STS (when the increase in the incident angle occurs); however, the pattern period in vertical direction is of a constant value.

Modification in the intensity profile of the multi-beam field occurs due to the rotation of STS around the optical axis in the plane XOY (fig.1). At the incident angle $\Theta=16\text{deg}$, the modification in the interference pattern is registered for the rotation angles $\alpha = 45\text{deg}$, 90deg and 315deg . Fig.4 illustrates the transformation of the multi-beam interference field.



(a)



(b)

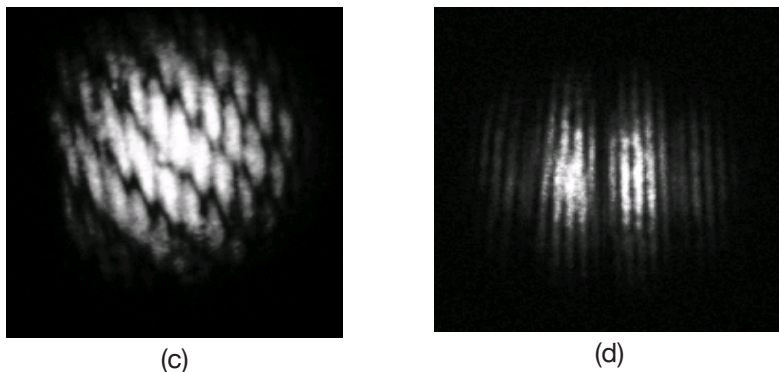


Fig. 4. Modification in the intensity profile of the multi-beam interference field in the scheme with two splitters: (a) $\alpha = 0\text{deg}$, (b) $\alpha = 45\text{deg}$, (c) $\alpha = 315\text{deg}$, (d) $\alpha = 90\text{deg}$

The initially symmetric intensity profile (fig.4a) transforms into the set of interference fringes (narrow fringes on broad fringes are superimposed), when the rotation angle becomes equal to 90deg (fig.4d). In other cases, we deal with the intermediate of intensity profile transformation (fig.4b, c). This phenomenon occurs due to the orientation change of horizontal fringes (the reflection from the back semi-transparent splitter 2, fig.1). Vertical fringes distribution (the reflection from the front semi-transparent splitter 1, fig.1) is held at the fixed position.

Also, we demonstrate the influence of the beam divergence change on the distribution of interference maximums (fig.5). The change in the beam divergence is produced by the displacement of lens L_2 (fig.1) from its initial position ($d=37\text{cm}$) at the fixed incident angle $\Theta = 16\text{deg}$. In our experiment the focal length of lens L_2 was equal to 60cm and initial distance between L_2 and STS – $d=37\text{cm}$. At such position of optical elements, we deal with the collimated beam 2.5cm in diameter D . By displacing L_2 from its initial position, the diameter of beam is changed and the transformation of the collimated beam into the divergent one occurs. In this case the reflected field is the divergent field also. Registration plane is located at distance 40cm from STS.

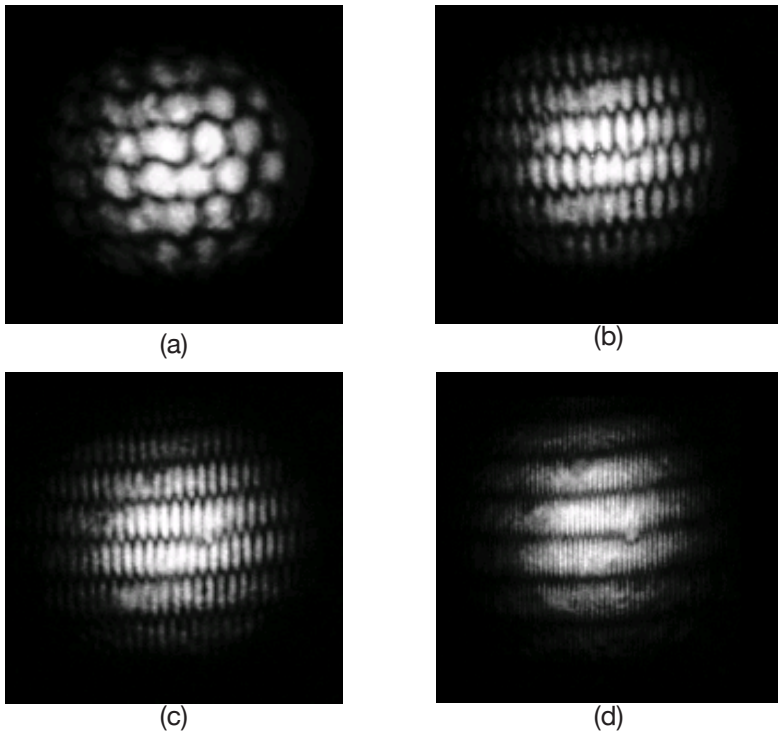


Fig. 5. Dependence of interference maximum distribution on the divergence of Gaussian beam: (a) $d=30\text{cm}$, $D=2\text{cm}$, (b) $d=37\text{cm}$, $D=2.5\text{cm}$, (c) $d=64\text{cm}$, $D=3\text{cm}$, (d) $d=70\text{cm}$, $D=3.5\text{cm}$

Changes in the maximums shape and in the period of interference pattern are registered. Besides, when the beam divergence has a sufficiently large value (fig.5f), the diffraction phenomenon is observed to a greater extent than for the optical scheme with the collimated beam. In addition, defects of splitters and foreign particles (between splitters) become apparent as the diffraction by obstacle.

Fig.6 shows the possibility to convert the elongated shape of maximum (fig.6a) into the circular one (fig.6b) by increasing the air wedge angle. At the fixed incident angle of 20° we deal with a two-dimensional matrix of interference maximums of the size 20×20 (fig.6b). In this case, the period of vertical interference fringes as the reflection result from the front semi-transparent splitter and the period of horizontal interference fringes as the reflection result from the back splitter are equal.

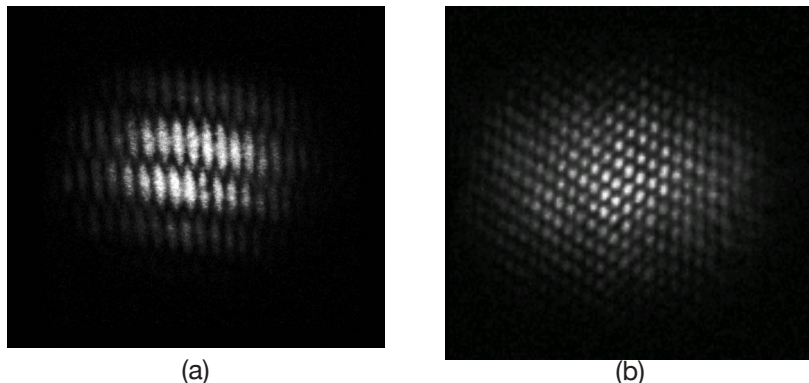


Fig.6. Influence of the air wedge angle on the interference pattern

Conclusions

We have demonstrated the simple method of generating the symmetric multi-beam interference optical fields using the four-beam interference under the condition of reflection of collimated Gaussian beam from the set of two semi-transparent splitters. The change in the beam incident angle, the rotation of semi-transparent splitters set around the optical axis, the change in beam divergence and the variation of the air wedge angle lead to the controlled reorganization of the multi-beam interference optical field. The combination in the micro- and macro-size of the interference structure of the multi-beam field and the variation in the beam-forming region, as well as features of the interference pattern modification by both methods are of interest for optical information processing, for cold atom manipulation and for the point laser exposure of bio-objects in the field of ophthalmosurgery and therapy.

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ANALOGY BETWEEN MULTIDIMENSIONAL OPEN UNIVERSE MODELS AND ELECTRIC CAPACITORS

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An analogy between electrostatics of conductors and open cosmological models in conformally flat multidimensional space-time with Fock's metric form as solutions of the multidimensional Einstein equations is considered. It is shown that capacity of the multidimensional "ball" electric capacitor in multidimensional Euclidean auxiliary space is connected with harmonic functions by which the potentials of multidimensional capacitors are described. In particular, the Friedmann solution for the open Universe filled with incoherent dust is connected with a harmonic function of the Coulomb type in 3D auxiliary Euclidean space. The results are listed in two tables.

Keywords: open cosmological models, multidimensional space-times, linear equation of state, multidimensional electric capacitor.

Introduction

The approach to deriving of cosmological models of the open Universe according to various physical states is based as a rule on the solution of the gravitational equations with specific linear equations of state as it is shown in [1-3]. Another approach can be seen in [4-5].

In this research there is an attempt to consider such cosmological models on the other hand using the analogies with electrostatics of conductors. The conductors create a multidimensional system which can be further named as the multidimensional electric capacitor or n -capacitor.

At research of conformal-flat spaces on the basis of General Relativity the deriving and the physical analysis of corresponding cosmological models is often carried out in a synchronous frame of reference. Such way is not always good from the point of view of finding of exact analytical solutions of the Einstein equations because of mathematical difficulties.

However this problem can be solved with use of noncomoving frame of reference in which the space-time metric is conformal-flat and the conformal factor depends only on one variable playing a role of distance in a 4-Minkowski universes (see an approach of Fock [6]). At the same time, it turns out that this description is equivalent to the introduction of a kinematic reference frame (see, for example, [7]) instead of the synchronous frame of reference. In addition, the use of the synchronous reference frame not fully corresponds to the symmetry of the cosmological problem, where metric depends on the one variable (see, for example, [3]).

We will continue to use further the Fock approach, in which a metric of the multidimensional space-times is conformal to the Minkowski space-time and conformal factor is a function of one variable.

In this research there is an attempt to consider such cosmological models from another viewpoint, using their analogies with electrostatics of conductors. The conductors create a multidimensional system which may be named as a multidimensional electric capacitor or n -capacitor.

1. Multidimensional Space-Time Approach

We will consider multidimensional open cosmological models with metrics conformal to Minkowski's metric as generalizations of the open Friedmann Universe [8]. We will take the number of space-like dimensionalities up to $m > 4$, leaving one dimensionality as time-like. So we write down a metric in the Fock form [6] as

$$ds^2 = \exp(2\sigma)\eta_{\mu\nu}dx^\mu dx^\nu, \quad (1)$$

where the Greek indices run through values $\mu, \nu = 0, 1, 2, \dots, m$ with $m = N + 1$ and N is the number of the space-like coordinates, $\eta_{\mu\nu} = \text{diag}(+1, -1, -1, \dots, -1)$ is the Minkowski type metric tensor of multidimensional space-time; $\exp(2\sigma)$ is the conformal factor; $\sigma = \sigma(S)$; $S^2 = \eta_{\mu\nu}x^\mu x^\nu$, the velocity of light and Newton's gravitational constant are equal to unit, and the Einstein gravitational constant is equal here $\kappa = 8\pi$.

The gravitational field equations are postulated in the form of the Einstein system equations (without a cosmological constant)

$$G_{\mu\nu} = R_{\mu\nu} - g_{\mu\nu}R = -\kappa T_{\mu\nu} \quad (2)$$

and with the matter source of gravitational field in form of the energy-momentum tensor (EMT) in an approximation of the perfect Pascal fluid

$$T_{\mu\nu} = \varepsilon U_\mu U_\nu + p B_{\mu\nu} \quad (3)$$

with a linear equation of state

$$p = \beta \cdot \varepsilon, \quad (4)$$

where : $G_{\mu\nu}$ is the Einstein tensor, $R_{\mu\nu}$ is the Ricci tensor; R is the scalar curvature; κ is the Einstein gravitational constant; ε is an energy density; p is a pressure; $\beta = \text{const}$ and for the energy dominance $|\beta| < 1$; $U_\mu = (\exp(\sigma)) \cdot b_\mu$ is a 4-velocity; $b_\mu \equiv S_{,\mu}$; $B_{\mu\nu} = (U_\mu U_\nu - g_{\mu\nu})$; is a m -projector or N -metric tensor which orthogonal to U^μ , $B_{\mu\nu} U^\mu = 0$; the velocity of light and the Newton gravitational constant are taken equal to unit.

Further the Einstein equations can be splintered by means of projecting physical values onto the time-like direction and ND-surface which is orthogonal to this direction. It is the method of $(N+1)$ -split in General relativity [9-10] for finding physical observable values. For example, the projection of $T_{\mu\nu}$ onto time-like direction is $T_{\mu\nu} U^\mu U^\nu = \varepsilon$ and the projection of $T_{\mu\nu}$ onto ND-plane is $T_{\mu\nu} B^{\mu\lambda} = -p B_\nu^\lambda$.

In our case taking into account relation (4) the field equations system can be reduced to equation

$$\sigma'' + ((N-1) + \beta N) / S \cdot \sigma' + ((N-2) + \beta N) / 2 \cdot (\sigma')^2 = 0, \quad (5)$$

where a prime denotes the derivation with respect to S .

If we make a substitute

$$\sigma(S) = \frac{2}{(N-2) + \beta N} \cdot \ln \Phi(S), \quad (6)$$

then Eq. (7) is modified into equation ($\nu = N(1 + \beta)$)

$$\Phi''_{(\nu)} + \frac{(\nu-1)}{S} \cdot \Phi'_{(\nu)} = 0 \quad (7)$$

which is the Laplace equation of multidimensional Euclidean spherical space if we will take β as discrete quantity (rational number)

$$\lambda \equiv n; \quad N(1 + \beta) = n, \quad \beta = \frac{n-N}{N} \quad (8)$$

with n as an integer.

In this case the solutions of Eq. (6) are the harmonic functions

$$\Phi_{(n)} = B_{(n)} + \frac{A_{(n)}}{S^{n-2}}, \quad n \neq 2; \quad \Phi_{(2)} = B_{(2)} + A_{(2)} \ln(a_0 S), \quad n = 2, \quad (9)$$

where a choice of constants B_n, A_n, B_2, A_2, a_0 is connected with a special physical asymptotic behavior of conformal factor.

Furthermore n is a dimension of multidimensional Euclid space, $n = 0, 1, 2, \dots, 2N$ ($n = 2N$ for $\beta = +1$) and from the energy dominance

principle $|\beta| \leq 1$ we may construct Table 1 for the rational values β . Each value β correspond to concrete harmonic function.

Thus we can replace the cosmological problem in pseudo Riemannian m D-space-time by the investigation in an auxiliary multidimensional Euclidean n -dimensional space.

2. Variational problem in multidimensional Euclidean space

Let the set of Euclidean n -dimensional space M_n where the variable S plays the role of the radial variable. This variable can be written using Cartesian coordinates ξ^A in this space

$$S^2 = \delta_{AB} \xi^A \xi^B \quad (10)$$

where $\delta_{AB} = \text{diag}(1, 1, 1, \dots, 1)$; $A, B, \dots, D = 1, 2, \dots, n$ and in this space a time-like coordinate is absent.

Now we introduce a differential 1-form

$$\mathbf{E}_{(n)} = -(\nabla_A y^{(n)}) \mathbf{d}\xi^A \equiv -y^{(n)}_{,A} \mathbf{d}\xi^A \equiv E_A^{(n)} \mathbf{d}\xi^A \quad (11)$$

where in the Euclidean space we can write $\nabla_A = \partial / \partial \xi^A$; $y^{(n)} = y^{(n)}(S)$.

This differential 1-form (10) is closed, i. e. $\mathbf{dE}_{(n)} = 0$ (\mathbf{d} is an external differential). We will set

$|\mathbf{E}_{(n)}|^2 = E_A E^A = \delta^{AB} \nabla_A y^{(n)} \nabla_B y^{(n)}$ and write the "energy" functional in the form

$$\begin{aligned} E^{(n)} &= \alpha_0^{(n)} \int_{V_{(n)}} |\mathbf{E}_{(n)}|^2 dV_{(n)} = \\ &= \alpha_0^{(n)} \int_{V_{(n)}} (E_A E^A) dV_{(n)} = \alpha_0^{(n)} \int_{V_{(n)}} \delta^{AB} \nabla_A y^{(n)} \nabla_B y^{(n)} dV_{(n)}, \end{aligned} \quad (12)$$

where $\{\alpha_0^{(n)}\}$ are the constant coefficients which simulate corresponding "permittivities", $V_{(n)}$ is n -dimensional volume of an integration in $M_{(n)}$ for $n=3$, $\{E_A\} = (E_1, E_2, E_3) = \vec{E}$ is an analog of an electric field intensity. The requirement of the minimum for such functional ($\delta_v E^{(n)} = 0$) leads to the Laplace equation

$$(\delta_{AB} \nabla_A \nabla_B) y^{(n)} = \Delta_{(n)} y^{(n)} = 0 \quad (13)$$

or

$$\nabla_A E^A = 0 \quad (14)$$

This equation corresponds to Maxwell's equation $\text{div } \vec{E} = 0$ in the absence of charges (\vec{E} is the electrical field intensity) for $k=3$, and equation

(13) is identical with Eq.(7) on the other hand, i.e. the differential operator $\Delta_{(n)}$ is the radial part of the Laplace equation in n -dimensional Euclidean space.

Table 1.
The quantity of $\beta = p / \varepsilon$ in space-times of dimensions more than four.

N/n	1	2	3	4	5	6	7	8	9	10	11
0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	...
1	0	-1/2	-2/3	-3/4	-4/5	-5/6	-6/7	-7/8	-8/9	-9/10	...
2	+1	0	-1/3	-2/4	-3/5	-4/6	-5/7	-6/8	-7/9	-8/10	...
3		+1/2	0	-1/4	-2/5	-3/6	-4/7	-5/8	-6/9	-7/10	...
4		+1	+1/3	0	-1/5	-2/6	-3/7	-4/8	-5/9	-6/10	...
5			+2/3	+1/4	0	-1/6	-2/7	-3/8	-4/9	-5/10	...
6			+1	+2/4	+1/5	0	-1/7	-2/8	-3/9	-4/10	...
7				+3/4	+2/5	+1/6	0	-1/8	-2/9	-3/10	...
8				+1	+3/5	+2/6	+1/7	0	-1/9	-2/10	...
9					+4/5	+3/6	+2/7	+1/8	0	-1/10	...
10					+1	+4/6	+3/7	+2/8	+1/9	0	...
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Thus, the cosmological problem with conformally flat metric (1) and with the equation of state (4) can be replaced by the variational problem analogous to the minimization of the energy of electrostatic potentials' distribution in the multidimensional Euclidean space. In this case functions $y^{(n)}(S)$ play the role of electrostatic potentials, and E_A are analogues of the electrostatic field intensity in $M_{(n)}$.

3. The multidimensional capacitors' concept

In the future we will keep in mind the presence of two "conductors", which act as the capacitor plates and restrict the space part $M_{(n)}$. These "plates" are the hypersurfaces. They have the dimensionality less than dimensionality of $M_{(n)}$. Areas of these hypersurfaces we will mark as $\Sigma_{(n)}$ and the dimensionality as $(n - 1)$.

Now we will demand boundary conditions as the 3D analogue

$$y^{(n)}_{|\Sigma_{(n)}^{(1)}} - y^{(n)}_{|\Sigma_{(n)}^{(2)}} = U^{(n)} \quad (15)$$

where $U^{(n)}$ are the analogues of the potential difference (voltages); $U^{(n)}$ are taken on the different conductors. The "potentials" on the hypersurfaces

$\Sigma_{(n)}^{(1)}$ and $\Sigma_{(n)}^{(2)}$ are constants.

We use an identity

$$\delta^{AB} \nabla_A y^{(n)} \nabla_B y^{(n)} = -y^{(n)} (\delta^{AB} \nabla_A \nabla_B) y^{(n)} + \delta^{AB} \nabla_A (y^{(n)} \nabla_B y^{(n)}) \quad (16)$$

and a generalization of the Gauss theorem (\mathbf{F}^A is some vector)

$$\int_{V_{(n)}} (\nabla_A \mathbf{F}^A) dV_{(n)} = \oint_{\Sigma_{(n)}} (\mathbf{F}^A n_A) d\Sigma_{(n)} \quad (17)$$

where n_A is a normal unit vector to the hypersurface, $n_A n^A = 1$

Then we can transform the expression (16) to the form

$$\mathbf{E}^{(n)} / \alpha_0^{(n)} = \int_{V_{(n)}} y^{(n)} (\nabla_A E^A) dV_{(n)} + \oint_{\Sigma_{(n)}} y^{(n)} (\delta^{AB} n_B \nabla_A y^{(n)}) d\Sigma_{(n)}. \quad (18)$$

The integral over the volume disappears taking into account Eq. (13). Second integral is taken over the “plates” (hypersurfaces), i.e.

$\Sigma_{(n)} = \Sigma_{(n)}^{(1)} + \Sigma_{(n)}^{(2)}$. So this integral over the hypersurface taking into account the boundary condition (14) is transformed into

$$\mathbf{E}^{(n)} / \alpha_0^{(n)} = y^{(n)}|_{\Sigma_{(n)}^{(1)}} \cdot \oint (n^A \nabla_A y^{(n)}) d\Sigma_{(n)}^{(1)} - y^{(n)}|_{\Sigma_{(n)}^{(2)}} \cdot \oint (n^A \nabla_A y^{(n)}) d\Sigma_{(n)}^{(2)}. \quad (19)$$

In an electrostatics with $k = 3$ for the vector of the electric field intensity, taken onto the surface covering charge. This surface is an equipotential surface and there is the true equality $(\vec{\mathbf{E}} \cdot \vec{\mathbf{n}}) \cdot \Sigma_{(3)} = -4\pi \cdot Q_{(3)}$, where $\Sigma_{(3)} = 4\pi \cdot S^2$.

In multidimensional case we can write ($n > 2$)

$$n^A \nabla_A y^{(n)} = \alpha_{(n)} Q_{(n)} (n-2), \quad (20)$$

where $Q_{(n)}$ are analogues of charges, and the coefficients $\alpha_{(n)}$ are here

$$\alpha_{(n)} = \begin{cases} n\pi^b / b!; & n = 2b; \\ & (b = 1, 2, \dots) \\ \pi^b b! 2^n / (n-1)! & n = 2b + 1. \end{cases} \quad (21)$$

Then the expression (18) is rewritten as

$$\mathbf{E}^{(n)} = \alpha_0^{(n)} \cdot \alpha_{(n)} U_{(n)} Q_{(n)} (n-2). \quad (22)$$

By analogy with the three dimensional space we will determine the

capacity of two conductors as the coefficient linking the electric charge and the electric potential difference:

$$Q_{(n)} = C_{(n)} \cdot U_{(n)} \quad (23)$$

where $C_{(n)}$ are analogues of the electrical capacities in the multidimensional space.

Finally we get the equality

$$\mathbf{E}^{(n)} = (n-2) \cdot \alpha_0^{(n)} \cdot \alpha_{(n)} U_{(n)}^2 C_{(n)} \quad (24)$$

Therefore the expression (24) establishes a minimum value of the system capacity for the given boundary conditions. We must here say that the capacity of the capacitor depends both on the shape and size of the conductors.

4. Cosmological models, multidimensional capacitors and harmonic functions

Now we can find $C_{(n)}$ by taking into account the expression (22) and $\mathbf{E}^{(n)}$ from Eq. (23) as

$$C_{(n)} = (n-2) \cdot \alpha_0^{(n)} \alpha_{(n)} \cdot Q_{(n)}^2 / \mathbf{E}^{(n)} \quad (25)$$

If the functions $y^{(n)}$ are solutions of the Laplace equation (13) we can compute the energy functional $\mathbf{E}^{(n)}$ for closed shells ("balls") $\Sigma_{(n)}$ very easily. The operator $\Delta_{(n)}$ is only a radial part of total Laplace operator. The solutions $y^{(n)}$ of such equation are well known:

$$y_{(n)} = A_{(n)} / S^{n-2}; \quad n \geq 3 \quad (26)$$

Here $A_{(n)}$ are the analogues of electric charges on the plates.

At first we will substitute the derivatives of the function $y^{(n)}$ in Eq. (12). Then we will integrate over the space between the shells when $n > 2$. After taking into account Eq. (15) and $dV_{(n)} = \alpha_{(n)} S^{n-1} dS$ we get the following expression of a multidimensional "ball" capacitor

$$\mathbf{E}^{(n)} = \alpha_0^{(n)} \cdot \alpha_{(n)} (n-1) A_{(n)} U_{(n)}. \quad (27)$$

If we now will make "grounding" one of the capacitor plates, the total electric charge of the capacitor will be equal to the zero and $U_{(n)}$ will be written as the potential of the interior "ball"

$$U_{(n)} = \Phi_{(n)} = A_{(n)} (1/S_1^{n-2} - 1/S_2^{n-2}). \quad (28)$$

Substituting the expression (28) in (27) and making choice of $Q_{(n)} \equiv A_{(n)}$ we have from Eq. (24)

$$C_{(n)} = \alpha_0^{(n)} \alpha_{(n)} Q_{(n)} / \Phi_{(n)} = \alpha_0^{(n)} \alpha_{(n)} (1/S_1^{n-2} - 1/S_2^{n-2})^{-1} \quad (29)$$

or

$$C_{(n)} \Phi_{(n)} = \alpha_0^{(n)} \alpha_{(n)} Q_{(n)} . \quad (30)$$

Now choosing the “permittivity” so that when the value $C_{(n)} \rightarrow \alpha_0^{(n)} \alpha_{(n)}$, $S_1^{n-1} \equiv q_{(n)}$ i.e. $\alpha_0^{(n)} = q_{(n)} / (\alpha_{(n)} S_1^{n-2})$ we get to the expression

$$C_{(n)} = q_{(n)} (1 - (S_1 / S_2)^{n-2})^{-1} . \quad (31)$$

Further we fix S_1 and allow the radius $S_2 \equiv S$ be changed. In this case we will have $C_{(n)} = C_{(n)}(S)$, and the expression (31) can be rewritten as

$$C_{(n)}(S) \cdot \varphi_{(n)}(S) = q_{(n)} , \quad (32)$$

where we demand that the functions $\varphi_{(n)}(S)$ were identical to the functions $\Phi_{(n)}$ which are the solutions of Eq.(7). We immediately find that for $n > 3$

$$\exp(2\sigma) = (\varphi_{(n)})^{4/(n-2)} = (q_{(n)} / C_{(n)})^{4/(n-2)} , \quad (33)$$

i.e. the finding of metric of conformally flat cosmological models with special equation of state can be connected with the computation of a capacity of the ball multidimensional capacitor and then using of the expression (33).

If in the expression (29) the value of S_2 runs to infinity, we get the capacity of the isolated body

$$C_{(n)} = (q_{(n)} / \tilde{q}_{(n)}) S^{n-2} , \quad (34)$$

where now $\alpha_0^{(n)} \alpha_{(n)} = q_{(n)} / \tilde{q}_{(n)}$; $S_1 \equiv S$. The expression (33) is transformed in this case into

$$\exp(2\sigma) = ((q_{(n)} / \tilde{q}_{(n)}) / S^{(n-2)})^{4/(n-2)} . \quad (35)$$

Further we need to consider separately the variants of the conformal factor for degenerate cases with $n = 0, 1, 2$.

5. The exceptions of general approach

The above was studied for the metrics with Galilean asymptotics on infinity ($S \rightarrow \infty$).

For the models with the equations of state $\beta = -1, -2/3, -1/3$, which correspond to $n = 0, 1, 2$ we must return to the original equation (13).

The physical state with $\beta = -1$ corresponds to $n = 0$ and we can not integrate the expression (11), but the solution of Eq. (6) in this case describes the De-Sitter model of the physical vacuum in chosen coordinates here (see [1], [3], [11]).

In the one-dimensional ancillary Euclidean space ($n=1, \beta=-2/3$) we have $y_{(n)} = B_{(n)} + A_{(n)} S$ and $\mathbf{E}^{(1)} = \alpha_0^{(1)} A_{(1)}^2 (S_2 - S_1)$. Then the expression for $C_{(1)} \propto 1 / (S_1 - S_2) = 1/d$ can be interpreted as the capacity of the plane capacitor with a distance between plates which equals to $d = (S_2 - S_1)$. If

we will take this distance as variable value ($S_2 \equiv S > S_1$) then $C_1 = C_1(S)$ and $\exp(2\sigma) = (q_{(1)} / C_{(1)})^{-4} \propto 1/d^4$. The Euclidean asymptotics of this metric will be naturally broken.

When $n = 2$, i.e. $\beta = -1/3$, we must compare the equations (5) and (14) by putting $\sigma \equiv y_{(2)}$ with $y_{(2)} = B_{(2)} \ln(A_{(2)} \cdot S)$. The computations in two-dimensional case lead to $\mathbf{E}^{(2)} = 2\pi \cdot \alpha_0^{(2)} B_{(2)}^2 \ln(S_2 / S_1)$. Finally we will have the capacity of cylindrical capacitor $C_2 = (Q_{(2)} / \lambda)(\ln(S_2 / S_1))^{-1}$ with $\lambda = 2\pi \cdot \alpha_0^{(2)} B_{(2)}^2 / Q_{(2)}$. In this case we can have the different cosmological models depending on the choice of the value λ and of the variability of the capacitor plate radius.

For example, when $S_2 \equiv S$ and $\lambda = 2$ we find $\exp(2\sigma) = (S / S_1)^4$. This means that at a fixed spatial variable, such model is the cosmological model of Dirac [10]. If we assume that $S_2 \gg S_1 = S$ and $\lambda = 1$, then $\exp(2\sigma) = (S_2 / S_1)^2$. The metric with such conformal factor describes the Milne universe [10] in the interval of $0 < S < S_2$.

Conclusion

The above demonstration of the analogy between open cosmological models in 4D space-time and the “ball” capacitors in multidimensional spaces Euclidean shows the opportunity of replacement of cosmological problem by the equivalent electrostatic problem for the finding the capacity of capacitors under the given boundary conditions. In particular when $n = N$ we immediately have $\beta = 0$ or a generalization of the Friedmann open cosmological model.

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