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ARCHITECTURE

CONSTRUCTIONS OF MEDIEVAL BUILDINGS OF AZERBAIJAN WOVEN IN CARPETS

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КОНСТРУКЦИИ МОНУМЕНТАЛЬНЫХ СТРОЕНИЙ АЗЕРБАЙДЖАНА В КОВРАХ

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Abstract

Azerbaijani carpets are rarities of the best museums and private collections in the world. Each carpet weaving school is characterized by a clear compositional structure, the idea of rhythm, color, ornaments (geometric, floral), features of decorative design, technical methods, and all this contributed to the appearance of high-quality works of decorative and applied art-carpet.

Carpets are components of exceptional importance, both functional and artistic (art object) - of any size of the interiors of premises - both public housing, as well as palace apartments, and monumental buildings of Azerbaijan. Carpets covered the floors of the interiors of religious, memorial, and civil buildings, thus becoming associated with the very idea of architecture. The article focuses on the designs of monumental structures woven in carpets.

Аннотация

Азербайджанские ковры являются раритетами лучших музеев и частных коллекций мира. Для каждой ковроткаческой школы характерны четкий композиционный строй, идея ритма, колорит, орнаменты (геометрические, растительные), особенности декоративной разработки, технические приемы, и, все это способствовало появлению прекрасных ковров -высококачественных произведений декоративно – прикладного искусства .

Ковры- исключительной значимости компоненты- и функциональный, и художественный (артобъект) любой величины интерьеров помещений– как народного жилища, а также дворцовых апартаментов, так и монументальных строений Азербайджана. Ковры устилали полы интерьеров культовых, мемориальных, гражданских строений, становясь, таким образом связанными с самим замыслом архитектуры. Весьма выразителен пример ковра «Шейх Сефи» специально сотканного для мечети Гандилхана в Ардебиле (ковер «Шейх Сефи», 1539 г., музей Виктории и Альберта, Лондон), который в точности соответствует размерам его молебельного зала. [1,р.98-101].

Keywords: Azerbaijan, carpets. monumental buildings, constructions

Ключевые слова: Азербайджан, ковры, монументальные строения, конструкции

Композиционная разработка ковров, в которых дается тот или иной конструктивный узел или часть строения имеет богатое разнообразие примеров – это колонны, арки, купола, сталактиты, т.е. подкупольные конструкции. Именно конструкции дают возможность понять неистощимость идей и многообразие инженерно – технических приемов, а их усовершенствование непременно влекло изменения в пространственном решении строений, будучи непосредственным источником художественно – образного воздействия.

Богатство модификации куполов определялось типом строения, избранной конструктивной системой с целым комплексом задач, эстетическими воззрениями эпохи, мастерством зодчего. В выборе купольного перекрытия существенное значение приобретали подкупольные конструкции которым придавалось исключительное внимание как важ-

ному звену всей конструктивной системы, технике здания, от которой зависит устойчивость строения, его надежность. Переход от стен корпуса строения к купольному перекрытию осуществляется посредством подкупольных конструкций, среди них можно выделить несколько основных ведущих линий, имеющих многообразие вариантов – тромпы, сталактитовые и щитовидные паруса, перекрещивающиеся арки. Новаторские тенденции в области подкупольных конструкций существенным образом пополняли и обогащали круг их вариантов, состоявший из архитектурных идей эпохи.[2,р.146-149].

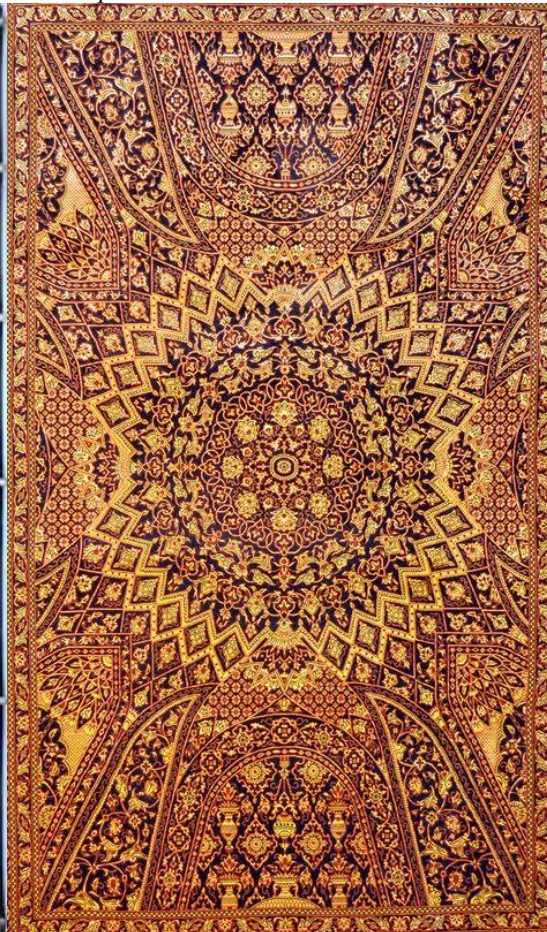
Вся изысканность выведения купола, покоящегося на подкупольных конструкциях, передается столь же точными насыщенными декоративными средствами в целом ряде ковров. Среди большого числа ковров, в коврах «намазлыг» (молитвенные),

композиция решается посредством изысканно прорисованных арок всевозможных конфигураций, с висящей по центру «ләмрә», опирающихся на колонны с базами или без них капителями, изображения которых зачастую несколько далеки от реальных. Иной вариант - спаренные арки или же три арки, где средняя - несколько шире симметричных., и, тоже на тонкостовольных опорах, часто спаренных. Их разнообразие в коврах определяется не

только прорисовкой, но и большей насыщенностью декоративного решения, а это обилие пышноцветущих растительных мотивов, «древо жизни», хотя встречаются и другие варианты –зооморфные элементы, схематизированные строения (мечеть), антропоморфное изображение - в полный рост. Вместе с тем встречаются и более сложные образцы композиции (Гарабахский молитвенный ковер, кон. XIX – нач. XX вв.)



Гянджа. Ковровый базар







Список литературы:

1. Райха Амензаде. Композиционные закономерности монументальных сооружений Азербайджана XI-XVII веков. Баку, 2007
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BIOLOGICAL SCIENCES

SPERM SEXING METHODS AND RECENT DEVELOPMENTS IN THIS FIELD: SYSTEMATIC REVIEW

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Abstract

Importance: Rapid growth in human population is putting a strain on agricultural industry. One of the ways to solving this problem is increasing the yield of farm animals by selecting the sex of the offspring.

Objective: To evaluate the effectiveness, safety and availability of various sperm sex sorting methods.

Evidence review: PubMed search engine was used to find published works on sperm sex selection methods in the MEDLINE database.

Findings: Search by key words yielded scientific articles describing many sperm sex sorting methods that make use of distinctive features of X- and Y-chromosome bearing sperm cells.

Conclusion and relevance: Many sperm sex sorting methods have been developed over the last half-century, but only some of them had a high level of reproducibility and proved to be reliable. Our review shows that further studies should be performed to eliminate drawbacks of the current methods and solve global problems in the field of animal husbandry and reproductive medicine.

Keywords: sperm sex selection, sex chromosomes, MicroSort, TLR7/TLR8, sex-specific proteins

SYSTEMATIC REVIEW

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Capsule: In this review we set out to paint a complete picture of modern state of sperm sex selection methods, provide comparison of their advantages and disadvantages and pinpoint the most promising techniques.

INTRODUCTION

Sperm sorting is defined as a separation of sperm cells based on certain parameters. The so-called sperm sexing techniques involve separation of sperm cells based on them carrying either an X or Y chromosome. Given the rapid and global growth in population, humanity is facing a threat of food shortage. This has increased the pressure on the agricultural industry where the sperm sexing methods – means of choosing offspring's gender – have become so popular. They give

farmers a more flexible method of production management, which in turn helps them provide sufficient resources for growing population [1].

In addition, sperm sexing is also used in medicine in the case of certain medical indications. For example, in order to prevent X-linked diseases that affect boys more often like Duchenne muscular dystrophy. If a couple has a high risk of conceiving a child with such diseases, this technology gives them a chance to have a healthy offspring and avoid abortion if the prenatal screening revealed any genetic defects [2]. Microsort sperm sexing technology based on flow cytometry was first used on human sperm in the last decade of the 20th century and allowed a woman who lost two brothers and two sons to an X-linked Hydrocephalus to finally give birth to a girl. Over time, the list of medical indications have been expanded and the FDA as an exception approved the use of Microsort to help couples reach family balance. However, strict requirements were set: 1) only couples that already have at least one child can participate in the program; 2) they can only select the non-dominant sex among their children. Also, couples have to keep in mind the probability of failed sex selection and doctors have to make sure that

a couple will accept a child of either sex in case of failed sex selection [3,4].

In this study we review sperm sexing methods that have been developed over the years taking into account differences discovered between X chromosome bearing and Y chromosome bearing sperm cells (X spermatozoa and Y spermatozoa), compare their effectiveness in sorting spermatozoa and safety of the technique.

Materials and methods

PubMed search engine was used to find scientific articles on sperm sex selection techniques in MEDLINE database with following key words and terms: sperm sex selection, sperm sexing, flow cytometry, MicroSort, albumin gradient, Percoll gradient, swim-up method, H-Y antigen, sex-specific proteins, sperm cell surface proteins, TLR 7/8. We primarily collected data on the reported ratio of X and Y spermatozoa in the semen after sperm sexing was completed, sex ratio among the embryos after fertilization and sex ratio after birth. All types of publications on sperm sexing methods, including original articles and reviews, published before April 2022 were included in the review, but works that contain data on the concentrations of X and Y spermatozoa after the sperm cells have been sorted were prioritized.

Two independent reviewers (A.M and Kh.Zh.) independently performed a search and screening of the articles found based on their title and abstract and excluded irrelevant citations. Any disagreement or uncertainty was resolved by the involvement of a third reviewer (G.B.)

Ericsson method

Scientists have been trying to develop sperm sex sorting methods for a long time by utilizing various qualitative and quantitative differences between X and Y chromosome bearing sperm cells, such as motility, shape, size, etc.

One of the first works on this subject was based on the probable difference in motility between X and Y spermatozoa.

First works describing the difference in motility between X and Y spermatozoa have been published by Ericsson et al. in 1973 using the albumin gradient [5]. It was discovered that a 25% albumin medium has the perfect consistency to separate sperm cells based on their motility by hindering the movement of low motility spermatozoa. Isolation fraction that contains high motility spermatozoa that managed to pass through the albumin gradient then were stained with quinacrine fluorochrome. This dye stains the distal end of the long arm of the Y chromosome, and at the time it was thought that it can be used to identify Y chromosomes. Authors found that 80% of spermatozoa in this fraction contain a Y chromosome [6]. In 1974 Ericsson patented this technique, known to us as the Ericsson method. In his patent, he noted this method's potential in sperm sexing and family planning [7]. Subsequently several authors tried to reproduce these experiments and use Ericsson method for sex selection and family planning but obtained contradicting results. Even though Ericsson describes cases of his method being used to obtain male offspring successfully [8], other

authors report inefficiency of this method for Y spermatozoa enrichment or obtained only a slight increase in Y spermatozoa concentration [9-12].

Still there are other works that managed to reproduce the results obtained by Ericsson. Rose et al. reported the live birth of 13 male children, 2 identical twin boys, and 2 twins – one boy and one girl – from 18 couples who wanted a son [13].

Percoll gradient

Discontinuous Percoll gradient has also been used as a potential tool to separate X and Y spermatozoa. Iizuka et al. Used 12-step (25-80%) Percoll gradient and discovered that 94% of sperm cells from 80% Percoll fraction do not stain with quinacrine. Therefore, authors presumed that they were X chromosome bearing sperm cells. All 6 pregnancies after intrauterine insemination (IUI) with sorted sperm lead to the live birth of girls [14].

Later Wang et al. used FISH to assess the effectiveness of 12-step Percoll gradient in sperm sexing and discovered only a slight enrichment of sperm with X spermatozoa (от 51:46 до 57:38), which was a far cry from the 94% reported by Iizuka [15, 16].

This discrepancy was subsequently explained by research done by Van Kooij and Van Oost. They performed Southern blot analysis with DNA probe (pDP34) which can distinguish loci on X and Y chromosome on spermatozoa isolated with 12-step Percoll gradient and found approximately equal number of X and Y spermatozoa in 80% Percoll fraction. However, 86% of spermatozoa from the same population were stained with quinacrine. These contradicting results made authors question the use of quinacrine staining to estimate X and Y spermatozoa ratio after the sorting [17].

Swim-up method

Following the density gradients, swim-up method has also been used to perform sperm sex selection based on the difference in motility between X and Y spermatozoa. Check et al. report obtaining high enrichment of Y sperm cells (83.6%) and male offspring (81%) after using this method. However, just like the previous authors, they used quinacrine to stain the obtained sperm population [18, 19]. Later Han et al. performed double FISH before and after swim-up method and did not discover significant changes in X and Y spermatozoa ratio [20, 21].

Sperm viability

Park et al. tested viability of X and Y spermatozoa in different pH conditions – 6.2, 7.2 and 8.2. They discovered that after storing boar semen at pH 6.2 for 2 and 4 days there are more dead Y spermatozoa than dead X spermatozoa. Ratio of viable X spermatozoa to Y spermatozoa is highest after two days (1.2:1). Moreover, using this sperm for IUI increased the number of female pups. Authors conclude that storing the sperm in acidic solution for 2 days before the IUI might significantly increase the chances of obtaining female offspring [22].

Flow cytometry

Another big dissimilarity between X and Y spermatozoa is the difference in DNA content. It is known

that X spermatozoa contain more DNA than Y spermatozoa (2.8% in humans and 4% in livestock) [23, 24]. If sperm cells are stained with fluorescent DNA dye, then X spermatozoa will have higher fluorescence. Among many DNA dyes the Hoechst 33342 turned out to be the best fit: 1) it is a vital stain (cells remain viable after staining); 2) it can pass through the cell membrane; 3) it is less genotoxic than other similar dyes like DAPI. This difference in fluorescence between X and Y spermatozoa after Hoechst 33342 staining has become the basis for the most conventional sperm selection method – flow cytometry [23]. First attempts to use this method for sperm sexing was made in animals such as bulls, boars, sheep and rabbits [24, 25]. The first breakthrough was achieved in 1989, when the first live offspring was obtained in rabbits [26]. In 1990, Schulman adapted this technology for humans and called it MicroSort [4]. In 1998, Vidal et al. published an article describing the results of using MicroSort technology on human sperm. When used to select X spermatozoa, the effectiveness of this method reached 80-90% and 60-70% - for Y spermatozoa [27].

In their article from 2009, Karabinus et al. provide data on MicroSort from the Genetics & IVF Institute. Between 1994 and 2007, they performed 5370 ART cycles with MicroSort. Among them, 3629 were IUI, 1642 – IVF/ICSI with fresh embryo transfer and 99 – IVF/ICSI with frozen embryo transfer (FET). 5871 sperm samples have been sexed, 74.9% (4399) of which were for X spermatozoa (XSort), while 25.1% (1472) – for Y spermatozoa (YSort). With XSort, an enrichment of 87.9% was reached; for YSort, that was equal to 73.4%. Eggs were fertilized in 70.7% of IVF/ICSI cycles and 93.8% of 2 pronuclei (2PN) embryos reached the cleavage stage. Pregnancy rate after IUI was 15.6% (567); after IVF/ICSI with fresh embryo transfer – 33% (525) and 33.3% (33) after FET. 801 of 1125 pregnancies resulted in the live birth of 943 babies (662 – singleton pregnancy, 272 – twin pregnancy and 9 – triplets) and 167 were ongoing. 92.0% of babies born after XSort were female and 81.5% of babies after YSort were male. Medical records of 760 were reviewed. It was discovered that 20 (2.6%) of them had major congenital malformation and 46 (6.1%) – minor congenital malformation [28].

In 2014, Karabinus et al. published another article with updated data from 2008 and 2012. Overall there has been a slight increase in the effectiveness of MicroSort technology [29].

In 2013, De Geyter et al. reported first successful pregnancy after sperm sexing with MicroSort in Switzerland. Medical indication for using MicroSort in this case was Becker muscular dystrophy. Two brothers of the woman in this couple were diagnosed with this disease. The couple rejected the option of prenatal diagnostics and possible legal abortion. For financial reasons the option of PGD in fertility clinics abroad has been ruled out. After long discussion, doctors suggested sperm sexing for ICSI. After receiving permission from ethics committee of University Hospital of Basel, authors contacted MicroSort representatives. Two samples of semen were obtained and sent to MicroSort lab after cryopreservation for sperm sexing. 14

oocytes in Metaphase stage II were obtained after ovarian hyperstimulation. All the sexed spermatozoa received from MicroSort were found to be immotile after thawing. The morning after the injection of 14 oocytes, 3 fertilized eggs with 2PN were discovered. Only one embryo reached blastocyst stage and was transferred into the uterine cavity. Intrauterine singleton pregnancy was diagnosed 14 days after oocyte retrieval [30].

Flow cytometric sperm sexing is one of the mainstream sperm selection methods, however, it has its shortcomings. One of the biggest drawbacks is Hoechst 33342 and UV radiation's effect on sperm viability and DNA integrity [31, 32]. Another downside of flow cytometry is low sorting speed, which prolongs the sperm sexing process to achieve high number of sorted spermatozoa. It may lead to some undesirable outcomes such as decreased motility or complete immobility of the sperm cells and can also affect embryo quality. It is known that the number of dead or damaged spermatozoa increases by 20% after the sorting [23]. Due to these reasons, scientists keep working on improving this technique and developing alternative sperm sexing methods.

One of such methods is the use of aptamers – oligonucleotides that specifically bind target molecules. Characteristics such as small size, high specificity, high affinity, accessibility and ability to renature after denaturation lead to its application in various fields, including sperm sex selection [33, 34].

Sex-specific proteins

Sperm sexing techniques of particular interest to scientists are the methods targeting the so-called sex-specific proteins on spermatozoa. The first discovered sex-specific protein was the H-Y antigen on the spermatozoa surface. It is first mentioned in the article by Eichwald and Silmsker who suggest that it is responsible for skin rejection after male-to-female syngeneic transplantation [35]. In 1971, Goldberg et al. discovered that this antigen is present on the surface of 50% of sperm cell population in mice [36]. It led to the suggestion that it is expressed solely by Y-chromosome and could be used for sperm sex sorting. It was later confirmed that the H-Y antigen is encoded by the Y-chromosome gene KDM5D, also known as SMCY. The homologous gene KDM5C, also known as SMCX, is present on the X-chromosome. A number of scientists worked – with varying degree of success – on the development of sperm sexing method with the H-Y antigen [35]. In the work by Ali et al. semen samples from three bulls were sorted and separated into two fractions (H-Y⁺ and H-Y⁻) by Fluorescence-activated cell sorting (FACS). After incubation with Feulgen stain, the H-Y⁺ fraction contained 76.1%, 88% and 76.7% Y chromosome in each semen sample, respectively, while X spermatozoa in the H-Y⁻ fraction was 74%, 64.6% and 77.8%, respectively [37]. Some articles questioning the effectiveness of this method and the role of the H-Y antigen for sperm sex selection have been published. In 1993, Hendriksen et al. sorted the sperm with flow cytometric method which was new at the time. Then the sorted sperm samples were incubated with anti-H-Y monoclonal antibodies. It was discovered that across all samples, only 20-50% of spermatozoa bound to the antibodies and there was

no significant difference between the X spermatozoa enriched and Y spermatozoa enriched fractions. The authors conclude that this experiment did not discover any proof of H-Y antigen expression on Y-spermatozoa [38]. In 1998, Sills et al. used immunological method with paramagnetic particles that is based on the presence of H-Y antigen on the sperm surface. They processed the sperm with anti-H-Y-antigen monoclonal antibodies (IgM) and then incubated it with anti-antibodies (IgM) bound to paramagnetic particles. Then sperm cells were separated into two fractions with the use of magnetic field - H-Y Ag+ and H-Y Ag-. In total, 1600 cells were analyzed with FISH – 800 from each fraction. In the H-Y Ag+ group, 54.1% of sperm cells contained Y chromosome, while 51% of sperm cells in H-Y Ag- contained X chromosome. Authors reached the conclusion that immunological techniques of the time that are based on H-Y antigen aren't capable of yielding high results when it comes to human sperm sex selection. Nonetheless they suggest that there may exist other sex-specific proteins that can be used for sperm sexing [39].

Among the works on sex-specific proteins, the most notable is research done by Umehara and colleagues. They investigated the effect of ligands on the X sperm cell surface receptors to develop a novel sperm sexing technique. 492 genes are encoded and expressed by X chromosome in mice sperm cells and 18 of them encode a receptor protein. 12 of them have common ligands with receptors encoded by autosomal genes, while the other 6 (Tlr8, Ar, Gpr174, Tlr7, Gpr34 and Edr2a) have unique ligands. Authors examined the presence of mRNA of these receptors in sperm cells with reverse transcription polymerase chain reaction (RT-PCR). Due to authors' previous experience in working with TLR2 and TLR4 ligands that negatively affect viability, motility and capacitation in mammalian sperm cells, they decided to focus on Toll-like receptors (TLR7 and TLR8). They verified the presence of TLR7/TLR8 on the surface of spermatids, epididymal and testicular spermatozoa, Leydig cells and to a lesser extent on the surface of Sertoli cells. After Immuno-FISH with X chromosome probe (X-paint) and anti-TLR7 antibody positive TLR7 signals were only observed in X chromosome bearing cells. After incubating the sperm cells with Resiquimod (R848), TLR7 and TLR8 ligand, Imiquimod (R837), TLR7 ligand, scientists discovered significant decrease in the number of highly active sperm in the upper layer following the swim-up test. They noted that ratio of X spermatozoa to Y spermatozoa in the upper layer had also decreased (X spermatozoa~20%, Y-spermatozoa~80%) [40]. It was shown that decreased motility of X spermatozoa and failure to swim to the upper layer during the swim-up test is caused by decreased ATP production by the mitochondria via phosphorylation of NF-kappaB (NF-κB) and Glycogen synthase kinase 3α/β (GSK3α/β) [41].

When sperm cells from the upper layer were used for fertilization, 77 embryos at the blastocyst stage were obtained: 68 of them were XY and 9 – XX. After the embryo transfer, 83.1% ± 4.6% of the pups were male. In the case of sperm cells from lower layer, they yielded 83 embryos at blastocyst stage: 58 were XX and 25

were XY. After embryo transfer, 81.4% ± 1.9% of the offspring were female [40]. Ren et al. applied the same procedure to goat sperm. After the swim-up test, the upper layer contained 90.5 ± 2.86 % Y spermatozoa and 9.28% X spermatozoa, while the lower layer contained 80.3 ± 2.91 % X spermatozoa and 15.7% Y spermatozoa. Due to the goal of the investigation being research into methods of increasing goat milk via increasing the birth rates of does, authors only used the sperm in the lower layer. After IVF they obtained 43 embryos, 35 of them were XX (81.4%). In addition, they used the lower layer sperm for IUI of 5 does, 9 embryos were collected from the two does that conceived. 8 embryos were XX and 1 embryo was XY, but due to the low sample number, these results can only be interpreted as preliminary [41]. In 2020, Umehara et al. published a full protocol of their sperm sex selection method for mice and bull sperm [42].

Toll-like receptors (TLR) are transmembrane proteins that are expressed on the cell surface of many mammalian organisms including mice and humans. At the moment 13 types of Toll-like receptors were identified. TLR1, 2, 4, 5 and 6 are located on the cell surface and mainly bind to bacterial components, while TLR3, 7, 8 and 9 that bind to virus-associated nucleic acids are located in endosomes. Signaling pathways of TLR7 and TLR8 lead to the activation of Interferon-regulating factors 5 and 7 (IRF5 and 7) and expression of Interferon-α, which plays an important role in antiviral immune defense [43]. TLR7 and TLR8 are activated by single-stranded virus RNA such as Hepatitis C, HIV and Zika virus [40]. Perhaps *in vivo* function of TLR7 and TLR8 is an evolutionary defensive mechanism against viral infection which is manifested as decreased spermatozoa motility and prevention of fertilization under adverse environmental conditions. If so, then presence of TLR7 and TLR8 only on X spermatozoa should mean that viral components can't affect Y spermatozoa and prevent fertilization, and therefore affect sex ratio (the ratio of males to females) among the offspring. Robertson and Sheard were first to report the possible connection between hepatitis and sex ratio among the newborns. They noticed unusual sex ratio in newborns after unexpected outbreak of infective hepatitis [44]. Results obtained from investigations in Greece and Greenland suggest that in the presence of Hepatitis B antigen (HBsAg+) in either of the parents, the sex ratio is higher than in parents that don't have Hepatitis B antigen [45, 46].

Table 1 contains a compilation of data on the effectiveness of various sperm sex selection methods based on the principle behind the technique.

Conclusion

Sperm sexing methods should be accurate, highly effective, fast, cheap, accessible by farmers and, most importantly, they shouldn't damage sperm cells. Our review showed many methods developed by relying on various differences between X and Y chromosome bearing sperm cells. But practical validity of some of the methods can be questioned due to inconsistency in their results. Only two sperm sexing methods – flow cytometry and use of ligands for sex-specific proteins – showed consistent and great results among the various

works. Despite being the mainstream sperm sex selection method today, flow cytometric technique still has a lot of shortcomings that we mentioned above. On the other hand, Umehara and colleagues managed to develop a simple, relatively cheap new sperm sex sorting technique that targets sex-specific receptors and doesn't affect quantitative and qualitative parameters of the sperm. It was developed only a few years ago and has already attracted the attention of scientists researching this field. It has a lot of potential to grow and more research is needed to perfect it and adapt it to other species. For example, there is no research describing the use of TLR7/TLR8 ligands for sperm sex selection in

humans. Moreover, recent studies revealed a plethora of new potential sex-specific proteins [40, 47, 48]. It opens up new opportunities for researching and developing new methods. We believe that the potential of an immunological approach in sperm sexing hasn't been fully realized, especially when it comes to using antibodies targeting sex-specific proteins and magnetic particles. Therefore, our efforts will be directed to research in this direction.

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Table 1.

Comparison of results of sperm sex selection methods

Sorting method	Authors	Sample	Target sperm cells	Percentage of target sperm cells after the sorting	Method used for determining the X spermatozoa:Y spermatozoa ratio after the sorting
Albumin gradient	Erickson, 1973	Human	Y	80%	fluorochrome quinacrine staining
	Vidal, 1993	Human	Y	49.4%	FISH
	Wang, 1994	Human	Y	46.7%	FISH
	Flaherty, 1997	Human	Y	49.1%	FISH
Percoll gradient	Iizuka, 1987	Human	X	94%	Quinacrine staining
	Van Kooij and Van Oost, 1992	Human	X	50% 86%	FISH Quinacrine staining
	Wang, 1994	Human	X	51-57%	FISH
	Andersen, 1997	Human	X	60.3%	FISH
Swim-up method	Check, 1989	Human	X	81%	Quinacrine staining
	Han, 1993	Human	X	50%	FISH
Viability of sperm cells under different pH conditions	Park, 2020	Boar	X	55%	FISH
Flow cytometry: X-sperm cells contain more DNA	Johnson, 1989	Rabbit	X and Y	X – 86%, Y – 81%	Flow cytometric analysis of sperm nuclei
	Johnson, 1993	Human	X and Y	X – 80% X – 75%	FISH
	Vidal, 1998	Human	X and Y	X – 86.83% Y – 67.43%	FISH
	Karabinus, 2014	Human	X and Y	X - 87.7 ± 5.0% Y - 74.3 ± 7.0%	FISH
Immunologic methods: H-Y antigen on Y-sperm cell surface	Ali, 1990	Bull	X and Y	X – 74% Y – 76.1%	Feulgen staining and scanning microdensitometry
	Sills, 1998	Human	X and Y	X – 51% Y – 54.1%	FISH
Ligand activation of TLR7/TLR8	Umehara, 2019	Mice	X and Y	Y – 91%	RT-PCR
	Ren, 2021	Goat	X and Y	X - 80.30% ± 2.91% Y - 90.50% ± 2.86%	Flow cytometric analysis

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CULTURAL SCIENCES

BLOCKCHAIN TECHNOLOGIES IN THE FORMATION OF CRYPTOCULTURE

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Abstract

The article analyses theoretical approaches of research of the concepts "blockchain technologies", "cryptoculture", correlation of these concepts with the database and NFT-tokens (digital assets) used in preserving the authenticity of cultural products. The author reveals the range of blockchain technology research in different areas of activity. The experience of Vietnam, the country leading the process of cryptocurrency introduction, is analysed. The base of legal regulation of crypto activity of the Republic of Belarus is summarised. The ambivalent nature of scientific research on this topic is revealed.

Keywords: blockchain technology, cryptoculture, digital assets, tokens, mining, bitcoin, crypto activities

Introduction. Blockchain technologies are gaining popularity and are used in various fields of activity. These technologies have significant potential also for the cultural sphere and in the near future can become an effective tool in the organisation of online libraries, digital art spaces, concert organisations, music services, fashion-centres and other cultural and educational projects.

Blockchain is a new technology of the XXI century, which appeared in 2008 during the next economic crisis. The dynamics of the global financial system, as well as the possibilities of its managerial transformations, predetermined the development of blockchain technologies, endowing them with declared properties: openness, immutability of data storage, absence of intermediaries, security, built-in protection against attacks, etc., which also began to be successfully used in the promotion, storage and transfer of cultural products.

The concept of "blockchain" comes from the two English words "block" and chain [1] and defines a technology that creates chains of information blocks (transactions) distributed among network participants. Each block contains information about the previous block, so that if one block is changed, all subsequent blocks automatically become invalid.

Blockchain also refers to a database for storing the entire history of transactions. The professional component of blockchain technology participants is not necessarily related to financial, analytical or economic spheres of activity. Blockchain technologies are effectively used in the cultural sphere, for example, in the promotion, storage and transmission of cultural products, as well as for their placement on interactive platforms, providing transparency of interactions, copy-right protection in the distribution of content.

The emergence of blockchain technology is associated with the pseudonym of the creator Satoshi Nakamoto or the group of developers of the cryptocurrency Bitcoin (2008), which became the first most famous cryptocurrency in the world [2].

Main part. Cryptoculture and blockchain technologies are associated with financial instruments, a male community of analysts, exchanges and trading, the possibility of quick enrichment, a private method of shopping, as well as decentralised technologies that are rapidly developing and are of increasing interest to the global community. Also these concepts are associated with the source of a large amount of energy - mining, i.e. "the activity of creating new structures (new blocks) that ensure the functioning of cryptocurrency platforms" [3].

The spectrum of crypto platforms is becoming versatile and includes not only financial and business areas, but also educational, scientific and cultural spheres of activity. In this regard, we can talk about the formation of a new phenomenon - "cryptoculture", based on blockchain technologies and uniting different areas of activity from financial and technological, social and legal, communicative to artistic and creative, such as digital art (painting, architecture, music, cinema, etc.).

Cryptoculture, as part of the Internet, combines real and virtual activities in the development, implementation and promotion of cultural products, using blockchain technologies and crypto platforms to stabilise their location or to perform intended actions with them (storage or distribution).

The etymology of the term "cryptoculture" connects two concepts: "crypt" (from Greek κρυπτή) – a covered underground passage; a hiding place [4] and "culture" (Latin. cultura) - cultivation; human achievements in the subjugation of nature, in technology, education, social order [5]. Moreover, "crypta" as a basis in the concept of "cryptography" (from Greek kryptos – secret; grapho - to write) is perceived as secret writing [5].

A similar meaning is embedded in the name of the element "krypton" (hidden, secret) - an inert gas discovered in 1898, a gas without colour, taste and smell in the famous table of D. I. Mendeleev [6].

In medicine, the term is actively used in naming various symptoms or diseases, somehow related in the meanings of "hidden", "unknown", for example [7]:

- «crypto-abscess» – an abscess in the crypt of the tonsil or colon;
- «cryptomnesia» – a memory disorder in which the boundaries between real events are erased;
- «cryptogenic» – a disease arising by unknown means, etc.

The combination of heterogeneous concepts of "crypto" and "culture" implies syncretism of virtual and real reality: technical, information and communication, artistic and creative with the possibility of fixing and commercialisation of cultural products, their placement and confirmation of copyright (uniqueness), with subsequent tracking through blockchain chains of their distribution.

Cryptoculture involves the user's theoretical and practical knowledge of:

- history of the emergence of cryptographic operations;
- legal regulation of cryptoculture in the country where the user plans to carry out this activity;
- types of cryptocurrency platforms and tools;
- development and distribution of digital cultural products based on blockchain technologies;
- terminology (ersatz language) used by users when working with blockchain technologies;
- risks and operational security.

Most scientific conclusions on the topic of cryptoculture are ambivalent. Some authors consider this phenomenon through the prism of the history of blockchain technologies, technological replication of cultural products; others link cryptoculture with the worldview philosophy of "uniting the world", which can be implemented with the help of decentralised technologies through a neutral infrastructure "to provide public goods" [8].

One of the advanced countries whose status is now considered the highest in shaping cryptoculture is Vietnam. The country is leading the mass adoption of cryptocurrency, with one in five Vietnamese respondents having knowledge in crypto innovation. The government has passed a law that recognises crypto transactions as a legal investment tool, and the country's Ministry of Finance is developing a strategy to develop the digital economy.

The rapid development of cryptoculture in Vietnam is due to several factors, according to Binh Nguyen, a researcher and funding programme manager at the Royal Melbourne Institute of Technology [9]:

- firstly, the Vietnamese market, where the average monthly salary is about 260 USD, is retail-oriented, and the majority of Vietnamese want to increase their savings through crypto platforms, thus insuring themselves against inflation;
- secondly, gambling is banned in the country, which encourages citizens to find legal alternatives;
- third, most Vietnamese emigrants who live and work abroad actively use crypto platforms to send money to their families, with low transfer fees;

- fourth, of the 97.5 million Vietnamese citizens, only 30 per cent have a bank account, and the proportion of internet users who own smartphones in Vietnam is 97.6 per cent. Therefore, crypto platforms are used as an alternative for storing and multiplying savings, with the possibility of fast money transfers if needed [10].

Well-known Vietnamese crypto companies Coin98 and Kyber, which have reached a market capitalisation of US\$1 billion, have strengthened Vietnam's reputation as a crypto investment hub.

The popularisation of crypto innovation in Vietnam was also helped by the emergence of Axie Infinity ("Axie Infinity", hereinafter referred to as Axie) in 2017, which later became one of the most famous online games in the world, developed on the basis of NFT (unique token stored on the blockchain).

NFT (Non-Fungible Token) - Non-Fungible Token is a digital content created based on blockchain technology, used to represent unique assets. Unlike ordinary tokens, non-fungible tokens cannot be substituted for each other, as they have their own unique identifier [11, p. 123].

The isolation and remote working of people during the Covid-19 period contributed to the particular success and spread of Axi. Thus, for the period in July 2020, the number of players from 28 thousand increased in December 2021 to 3 million [9].

The analysis of scientific literature allows us to assert that the concept of "cryptoculture" is at the stage of formation. Thus, Paul J. Ennison, associate professor at the University College of Business in Dublin, believes that the culture of cryptocurrency is unified and monolithic, and bitcoin is a "theory of society" based on the collapse of the paper monetary system. Decentralised services will expand and gradually replace centralised counterparts in the traditional world [12].

In scientific papers, P. Ennison understands cryptoculture as "an open-source community with its own microeconomy, embedded values in each blockchain, which develop on the basis of sociotechnical agreement, where values and technologies are mixed up" (P. Ennis) [12].

Researchers from the University of Illinois Andrew Bailey and Craig Warmke call bitcoin - a royal currency, given its characteristics of emergence, culture and market. Among the 13,457 types of currencies in 2023, bitcoin is one of the most honest currencies, the authors say. Every 10 minutes, one miner successfully creates a transaction fee and receives a certain number of bitcoins according to an automatic issuance schedule. Technology promotes honest behaviour of participants [13, p. 175-176].

Experts predict a maximum demand for the royal currency by 2040 of 21 million bitcoins [14, p. 178] (as of December 2023, the number of bitcoins reached 19.579 million out of 21 million) [15]. This currency does not require a bank account (only the presence of the Internet), today experts consider it as an investment to save money for the long term, with lower transaction costs.

For the Republic of Belarus, cryptoculture is still in its formative stage despite the fact that the Republic of Belarus is the first country in the world to legalise bitcoin in 2017 at the state level.

The legal regulation of crypto activity in the Republic of Belarus is enshrined in Decree No. 8 [16], where individuals are allowed to own digital tokens (tokens) and, taking into account the specifics established by the Decree (part 1, subparagraph 2.2, paragraph 2), perform the following operations [17]:

1. mining;
2. storage of digital signs (tokens) in virtual wallets;
3. exchange of digital signs (tokens), their alienation in national currency (Belarusian rubles), foreign currency, electronic money;
4. donation and bequest of digital signs (tokens).

Belarus ranks 65th out of 204 countries in terms of the number of cryptocurrency users. Transactions with tokens in the Republic of Belarus are not subject to value added tax, which makes crypto-investments more attractive. Despite such conditions, only 2.9% (270 thousand) of Belarusians are involved in crypto activities [18].

The scientific approach to cryptoinnovation and blockchain technologies can be observed in the activities of the International Association for Cryptographic Research (IACR), founded in 1982, which actively conducts scientific events (conferences, seminars, forums, etc.) and research on the theory of cryptography, information security and cryptoculture adaptability processes in the world [19].

Research confirms that the formation of cryptoculture based on blockchain technology is transforming people's behaviour and livelihoods. The way participants interact in P2P is based on trust and commitment to fulfil the transaction. Since P2P exchanges are decentralised, payments are verified by miners, a process called cryptostaking. P2P exchanges (Binance, OKX, Bybit, Garantex, etc.) serve people around the world, offer commission-free trading (e.g. Cryptus exchange) and high security protocols, and may eventually replace the traditional banking system. Active communications allow users to make international transactions, share news and trends, and organise and manage their businesses.

Scholars identify five patterns of cultural change that result in the formation of [20]:

- individualism and individualistic societies with weak ties and independent forms of communication;
- autonomy and distance from authority;
- stability and predictability, analysing situations, avoiding uncertainty and risks;
- male-type societies (European and US countries, Canada), characterised by: ambition, assertiveness, success and profit orientation;
- long-term and pragmatic future orientations.

The research findings highlight the specific cultural aspects in the implementation of crypto relationships in individualistic societies (e.g., such as the United States) and collectivistic societies (e.g., Chinese

society). For example, the level of trust in cryptoinnovations is higher in a collectivist society due to the high communication and support of social groups united by a common theme compared to an individualistic society. Here, crypto platforms are viewed from the perspective of self-centredness - achieving high returns in a short period of time, with the possibility of hiding personal data in transaction processes and storing money outside the legal boundaries of the state [20].

The collectivist approach in promoting cryptoculture is being considered in the United Arab Emirates. In Dubai in 2024 it is planned to present the project of a 40-storey hotel tower «Bitcoin Tower», built in the form of Bitcoin. The building will combine traditional hospitality and crypto services. Bitcoin Tower will become a symbol of the digital era of the XXI century. The symbol of the era should not only surprise with advanced technologies and luxurious accommodation, but also with innovative quality of service, offering hotel guests as a reward NFT (tokens) – as exclusive privileges proving authenticity and ownership in the digital sphere. According to the developers «this will be the first hotel to give you back the money you paid plus interest» [21].

This project aims not only to educate the general public about cryptoculture, but also to encourage those who use it. The project will involve artists, architects, musicians, and designers whose works will decorate the hotel, and guests will be able to purchase them if they wish.

Conclusion. Thus, cryptoculture as a paradigm of improving the digital environment of society on the basis of decentralised blockchain technologies, offers new rules of the game in protecting privacy, forms values, behavioural attitudes, levels of communication.

The concepts of "cryptoculture" and "blockchain technologies" have different approaches to definition and are mainly associated with financial activities, online trading, quick profits and high risks. The cryptocurrency market is comparable to a gold rush, it is still actively developing. Against this background, society is more focused on the financial component. Experts expect that by 2030 the cumulative growth rate of the global market (CAGR) will increase by 12.5%. But at the same time, about 70% of people today do not invest in cryptocurrency due to the lack of knowledge on this topic [22].

Blockchain technology as a «living breathing spreadsheet, operating in real time, verifying itself» [23], has inbuilt security, allows experimentation in art, gaming, exhibition, library and other fields. Cryptoculture is an amalgamation of a variety of digital ideas of different origins, geographical location, political, philosophical and educational directions, involving the development and realisation of artistic and creative cultural products, ensuring their uniqueness in the processes of replication. This topic is at the initial stage of development. The review of publications on the topic demonstrates the interest of the scientific community, suggests the intensity of research with serious analyses, expertise and timeliness.

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MEDICAL SCIENCES

URINE CULTURE GATHERED BY ANTISEPTIC BAG SAMPLE: IS IT A TECHNIQUE TO ESCAPE?

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Abstract

The diverse studies in literature concerning the consistency of urine gathered by bag method reveal opposing data. The study appraises the consistency of sterilised bag assortment in a cluster of children who had their first incident of urinary tract infection 1 to 36 months of age.

The research outcomes resulted from a multi-centre prospective randomised study. 410 patients performed 3 successive urinalysis and urine cultures. Urinalysis and urine culture development were held every month to the first 6 months; and then every additional month. The urine was gathered by antiseptic bag assortment in all children.

First urine culture indicated 376 E.Coli, only one urine culture altered from E.Coli to Proteus Mirabilis in the third urine culture. We accomplished 2385 repetitive urinalysis and urine cultures, only one impurity was constricted; 75 patients (22%) had a affirmative urine culture through the follow-up, 51 (15,4%) of them were girls. 26 (1,0%) febrile urinary tract infection were disqualified. 2243 (89%) urine cultures were negative; 33 (1,3%) contaminations; 55 (2,2%) asymptomatic bacteriuria; 26 (1,1%) lower urinary tract contamination. E.Coli was most recurrent micro-organism; it was found in 53 (49%) of all cases and in 75% of higher urinary tract infection.

A few number of infections was constricted in our enormous study, so we consider that sterile bag assortment is reliable.

Keywords: sterile bag urine, urine culture follow-up, febrile urinary tract infection

INTRODUCTION

The diagnosis of UTI may be proposed by definite signs and indicators, but culture of the urine is the golden standard (1). Regarding the fact that culture outcomes are not accessible for at least 24 hours, there has been substantial interest in assessing tests that may foretell the results of the urine culture so that suitable therapy can be started at the first meeting with the symptomatic patient (2).

The sensitivity of the standard UA is 81% (95% CI, 78%-85%) and does not change with age in febrile children younger than 2 years (3).

The non intrusive bag trial is frequently seen as the most striking choice for health staff and parents regardless of the distinguished risk of attaining a contaminated outcome on urine culture (4,5).

Available assortment methods comprise clean-voided bag collection, suprapubic aspiration, each with its own benefits and disadvantages (6).

Nosocomial urinary tract infection is the most conjoint infection attained in both hospitals and nursing homes and is typically linked to catheterisation (7).

Fifteen per cent of febrile UTI are correlated with renal scarring¹⁶ and the occurrence of re-infection through the first year after a UTI, has been evaluated to be up to 30% (8-9).

A urine culture should be achieved 1 wk after the conclusion of treatment of any UTI to confirm that the urine is sterile. Prior to the tendency of urinary tract infections to persist even in the lack of disposing ana-

tomic aspects, a follow-up urine culture should be accomplished periodically for 1–2 year, even when the child is asymptomatic (10).

Mass screening for bacteriuria in infancy appears to result principally in the discovery of innocent bacteriuria episodes and is not suggested (11).

It is mentioned that families and clinicians preserve a high index of doubt for repeated UTI, and to acquire a dipstick, urinalysis and/or culture for age-appropriate signs of UTI, involving unsolved fever. Screening urine cultures are not essential (Wettergren 1990 [C] (12).

Infants and children who has no symptoms following an episode of UTI should not regularly have their urine re-tested for infection. Asymptomatic bacteriuria is not a suggestion for follow-up (13).

We appraise the consistency of sterile bag collection and consider the cogency of routine follow-up urine cultures in a cluster of children who had their principal episode of urinary tract infection 1 to 36 months of age.

METHODS AND PATIENTS

The records of this study derived from 2 multi-centre prospective randomised studies (IRIS 1 & 2) (14) concerning the main end-point of the population involved was 407 patients age 1 month to 36 months (data from IRIS 1) (15). We achieved 2 consecutive urinalysis and urine cultures. Urine was gathered in a sterile urine bag; the two concordant consecutive urinalyses and cultures were obligatory to evaluate the hazard of wrong positive results. Urinalysis test outcomes with white cell counts $\geq 23/\mu\text{L}$, =1+ with dipstick and urine

culture tests with development of only one micro-organism $\geq 100\,000$ colony creating units/ml.

Concerning the secondary endpoint the population involved was 327(232 girls) children aged 1 month to 36 months when they presented with their first acknowledged incident of acute pyelonephritis among June 2018 and April 2020 (data from IRIS 2). Urine was gathered in a sterile urine bag. Outpatient urinalysis and urine culture were accomplished every month for the first 6 months, and then 3-monthly, in total 10 urinalysis and urine culture for every patient through 1 year of follow-up. Febrile UTI (urinalysis positive, urine culture positive 1 micro-organism > 100.000 CFU/ml and fever) were excepted for we diagnose a reason of their symptom (fever) and not from the repetitive controls. We measured contaminations (urinalysis

negative, so no leucocyturia, no pyuria, no nitrites and urine culture more than 1 micro-organism or < 100.000 CFU/ml); asymptomatic bacteriuria (urinalysis negative and urine culture positive: 1 micro-organism > 100.000 CFU/ml, no symptoms); lower UTI (urinalysis negative and urine culture positive: 1 micro-organism > 100.000 CFU/ml and low symptoms e.g.: irritability, smelly urine).

RESULTS

Principal outcome: an entire of 410 patients were comprised. First urine culture presented 382 E.Coli, only one urine culture changed from E.Coli to Proteus Mirabilis in the second urine culture. We contracted only one contamination (See Table 1).

Table 1.

The 2 consecutive urine cultures confrontation.

UC 2 \ UC 1	Contam.	E.Coli	Enterob.	K.Oxytoc	K.Pneum.	P.Aerug.	P.Mirab.	Total
Contamination	1	0	0	0	0	0	0	1
E.Coli	0	382	0	0	0	0	1	386
Enterobacter	0	0	3	0	0	0	0	3
K.Oxytoca	0	0	0	4	0	0	0	4
K.Pneumoniae	0	0	0	0	5	0	0	5
P.Aeruginosa	0	0	0	0	0	4	0	4
P.Mirabilis	0	0	0	0	0	0	4	4
Total	1	382	3	4	5	4	5	407

UC 1 – first urine culture;

UC 2 – second urine culture

We distinguished a high negative prognostic value, so that validate that a negative urinalysis is tracked almost by a negative urine culture, but we can't say the opposite, so the positive urinalysis is followed by negative urine culture. (See Table 2)

Table 2.

Predictive value of urinalysis.

Index	1 month	2 month	3 month	4 month	5 month	6 month	8 month	10 mo	12 mo
Sensibility	51	57	61	49	30	23	60	42	68
Specificity	94	95	93	96	98	99	100	98	98
Positive predictive value	43	45	54	51	52	34	76	68	58
Negative predictive value	98	99	98	97	94	97	98	96	100

Subordinate outcome: 2387 routine urinalysis and urine cultures were provided (data from IRIS 2); between June 2018 and April 2020, 24 centres registered and randomized 338 (234 girls) children aged 1 month to 36 months when they presented with their principal documented episode of acute pyelonephritis; median age 14,2 month; 77 patients (22%) had a positive urine culture during the follow-up, 54 (15,5%) of them were girls; 26 (1,10%) febrile UTI (urinalysis positive, urine culture positive 1 micro-organism > 100.000 CFU/ml and fever) were disqualified; 2248 (94%) urine cultures were negative; 116 (4%) urine cultures result positive: 33 (1,3%) contaminations (urinalysis negative, so no leucocyturia, no pyuria, no nitrites and urine culture more than 1 micro-organism or < 100.000 CFU/ml); 56 (2,3%) asymptomatic bacteriuria (urinalysis negative

and urine culture positive: 1 micro-organism > 100.000 CFU/ml, no symptoms); 28 (1,2%) lower UTI (urinalysis negative and urine culture positive: 1 micro-organism > 100.000 CFU/ml and low signs e.g.: irritability, smelly urine). E.Coli was most recurrent micro-organism; it was discovered in 55 (49%) of all positive cases and in 76% of upper UTI (See Table 3). 12 (10 girls) children presented only contamination for a total of 20 episodes; 12 children presented only lower UTI for a total of 20 episodes; 30 children presented asymptomatic bacteriuria for a total of 44 episodes; only 7 children presented mixed episodes. The cost of urinalysis is 2,4 euro, urine culture 11,5 euro, urine bag 1,3 euro and urine cup 0,8 euro: total of 16 euro for 1 control per patient. The total cost of 2387 controls is 38350 euro.

Table 3

Urine cultures microbes

	Febrile UTI	Lower UTI	Asymptomatic Bacteriuria	Total	%
E.Coli	22	18	19	51	50
P.Mirabilis	2	4	17	22	17,8
P.Aeruginosa	2	6	13	20	17,8
Kl.Pneumoniae	3	0	3	4	3,6
Klebsiella	0	3	4	5	5,4
Enterococcus	0	0	2	2	1,8
K.Oxytoca	2	0	1	1	1,8
Citrobacer	2	0	1	2	1,8
	33	31	60	107	100

DISCUSSION

The urine sample can be acquired in dissimilar modalities. Urine gathering techniques included freely voided ("clean-catch"), catheter, urine bag, diaper urine, and suprapubic aspiration. In small children it is hard to attain the sample by the spontaneously voiding technique.

Suprapubic aspiration is recounted to have the lowest contagion rates and is recognized to be the golden standard for diagnosing UTI in children (16).

This technique, though, is deliberated too aggressive by many nurses, physicians and parents and is not a technique usually used outside the neonatal period. When applied in Emergency Department setting, stated success rates in attaining a urine sample by supra-pubic aspiration have been as low as 45% versus a 100% success rate with catheterization (17). In numerous children the bladder may not be completely distended, which may enlighten the low success degree of suprapubic aspiration in this location.

Catheterization is observed by some parents, nurses and physicians as invasive. Catheterization could put the child at threat for UTI by hosting bacteria into the urethra or the bladder (18-19).

Lohr et al. reported an incidence of 10,6 % hospital acquired UTI in hospitalized children who had been catheterized (20).

Nosocomial UTI is the most common infection attained in hospitals and is typically correlated with catheterization. This infection would be even more common but for the application of the closed catheter system. Most alterations have not upgraded on the closed catheter itself. Even with particular care, this structure will not avoid bacteriuria. After bacteriuria progresses, the capability to limit its barriers is minimal. Once a catheter is put in place, the doctor must preserve two notions in mind: keep the catheter system closed in order to rearrange the onset of bacteriuria, and eliminate the catheter as soon as possible. If the catheter can be detached before bacteriuria develops, suspension becomes prevention (21).

In low-risk children, grave consequences of infection are far less likely, and the risks of missing a UTI are likely to be balanced by the risk of catheterization, counting pain, false-positive result, trauma, or even outline of infection. The physician thus may elect to apply a bag urine screening approach to decrease the number of excessive catheterizations. The concerns of

maintaining on a "catheterize all" strategy for all non-toxic-looking children with fever without basis may have the potential to guide to test resistance by health professionals and parents who are worried about a painful technique and the unidentified risk of introducing infection (22).

Considering the high rate of contamination and contrary clinical results related to bag urine cultures, we consider that bag urine samples should not be sent for culture. So, despite its "noninvasive" status, the use of bag urine cultures seems to surpass its benefits (23).

In our survey 410 patients age 1 month to 36 months (data from IRIS 1) (24) performed 2 successive urinalysis and urine cultures. Urine was gathered in a sterile urine bag. We observed a high specificity and high negative predictive assessment, so that validate that a negative urinalysis is monitored practically by a negative urine culture, but when the urinalysis marks positive (often 24%-68% of cases) the urine culture will be negative. From 386 E.Coli inaccessible in the first urine sample, only one urine culture altered from E.Coli to Proteus Mirabilis in the second sample urine culture. We constricted only one contagion, so we believe that sterile bag collection is consistent in the execution of urine culture test.

In relation to the efficacy of routine urine culture follow-up next the first febrile UTI, we make a assessment the literature (recommendations, textbooks, handbooks and articles).

Prior to the propensity of urinary tract infections to persist even in the ICK of predisposing anatomic factors, a follow-up urine culture should be accomplished occasionally for 1-2 year, even when the child has no symptoms (25).

Mass screening for bacteriuria in infancy appears to result mainly in the recognition of innocent bacteriuria incidents and is not recommended. However screening for bacteriuria in healthy children has no place in any age group, it is significant to perform urine cultures freely in symptomatic children, particularly in infants with high fever or failure to flourish (26).

It is suggested that families and clinicians preserve a high index of doubt for recurrent UTI, and to attain a dipstick, urinalysis and/or culture for age-appropriate symptoms of UTI, counting unexplained fever. Screening urine cultures are not essential (Wettergren 1990 [C])(27)

Infants and children who are asymptomatic following an episode of UTI should not routinely have their urine re-tested for infection. Asymptomatic bacteriuria is not an indication for follow-up (28).

Urine should be cultured any non precise illness and treatment should be ongoing as soon as the sample has been reserved. Routine urine culture in well children is not required (29)

There are presently no records to suggest that detection and treatment of asymptomatic bacteriuria prevents following pyelonephritis or renal scarring. Routine screening is expensive and outcomes in follow-up testing and imaging in a huge percentage of healthy children with false-positive tests.

Furthermore, a low threshold for attaining a urinalysis and culture should be preserved in the child with a previous history of UTI who has symptoms, however minor, that suggest the opportunity of recurrent infection (30).

Here appears to be no justification for routine episodic urine cultures in the asymptomatic child. However, a high guide of suspicion for probable breakthrough infections should be sustained (31).

The colleagues from Finland published their study about the Recurrence and follow-up after urinary tract infection under the age of 1 year (32). They examined the worth of routine urine monitoring after principal UTI in children who had their first UTI while less than 1 year of age by gathering and analysing 3-year follow-up data on these children and assessed the hazard factors for the repetition of UTI. It was a retrospective analysis of the children treated for their first UTI episode under the age of 1 year, during the years 1978–1984 was undertaken. Altogether 262 patients (128 boys and 134 girls) were identified from the hospital discharge registry. During that period, the routine follow-up of all children in Finland after their first UTI included monthly routine urine cultures for 2 years. The follow-up period after the primary UTI was 3 years. The first UTIs of the patients were caused by *Escherichia coli* in 89% of cases. No recurrent infections occurred in 174 children (66%) during the following 3 years; 45 of the 128 boys (35%) and 43 of the 134 girls (32%) had a total of 161 recurrent UTI episodes during the 3-year follow-up period. Recurrent UTI occurred in 61% of the cases (54) within 3 months, in 86% within 6 months, and in 92% within 1 year of the primary UTI. They concluded that the follow-up could be determined according to the grade of VUR. Since children with grade 1–2 VUR have a low risk for renal damage, their risk for recurrent UTI is similar to that of children without VUR, they could be left without any routine follow-up after the first UTI. Therefore, these patients do not need further imaging of VUR. Children with grade 3–5 VUR should be followed for UTI recurrences with monthly urine cultures if not on prophylactic

medication for 6 months after symptomatic UTI, because grade 3–5 VUR is a risk factor for recurrent infection and also for renal scarring.

In our study 2398 routine urinalysis and urine cultures were obtained; 338 (234 girls) children aged 1 month to 30 months when they presented with their first recognized episode of acute pyelonephritis completed a

follow-up of 1 year. The median age 14,1 month. 79 patients (23%) had a positive urine culture during the follow-up. Febrile UTI were excluded; 2252 (95%) urine cultures were negative; 119 (5%) urine cultures result positive: 34 (1,4%) contaminations; 57 (2,4%) asymptomatic bacteriuria; 28 (1,2%) lower UTI. *E. Coli* was most frequent micro-organism; it was found in 56 (50%) of all positive cases and in 77% of upper UTI (See Table 3). 13 (11 girls) children presented only contamination for a total of 18 episodes.

CONCLUSIONS

We contracted a low number of contaminations in our large study, so we believe that sterile bag collection is reliable. We noted a high negative predictive value, so that authenticate that a negative urinalysis is followed almost by a negative urine culture. Urine culture follow-up is not necessary for the children after first febrile UTI. Such an approach would result in significant cost savings.

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NITRIC OXIDE IN THE DEVELOPMENT OF ARTERIAL HYPERTENTION IN CHILDREN WITH OBESITY

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The results of research conducted in the last decade testify to the leading role of the vascular endothelium in the regulation of the work of the cardiovascular system, the dynamics of the state of the vascular wall, and the regulation of vascular functions. The intima of vessels provides a dynamic balance between vasodilating and vasoconstrictive factors, regulates the growth and proliferation of subendothelial cells and non-cellular structures, affects vascular permeability [1].

Endothelial cell dysfunction is a characteristic feature of vascular disease and is characterized by a decrease in angiogenic potential and bioavailability of nitric oxide (NO), impaired vasodilation and increased inflammation [2].

The main role in vasodilation belongs to NO [3]. Research in recent years in the field of vascular physiology has shown that the NO molecule, which is synthesized by the vascular endothelium, has a wide range of bioregulatory effects. NO is an unstable short-lived molecule with a half-life of 2-30 seconds, followed by transformation into nitrite and nitrate and excretion in the urine. Both an excess and a deficiency of NO can be significant in the pathogenesis of many diseases, if we take into account its important role in the regulation of the activity of all cells, organs and systems and the vital activity of the organism as a whole in normal and pathological.

Despite the enormous physiological importance of NO, the concentration dependence of its activity, basal concentrations, and how its levels fluctuate during certain pathological conditions [4], such as obesity and hypertension - the main components of metabolic syndrome remain unknown [5].

It is believed that vascular endothelium dysfunction plays a leading role in the formation and progression of hypertension. If in adults the issue of the regulatory influence of NO in hypertension is sufficiently studied, in pediatrics it remains open.

Aim. To identify the value of NO in the formation of hypertension in children with obesity, and to study their interdependence.

Material and methods. From a sample of 1.400 children and adolescents aged 9 to 18, 2 groups were formed. Group 1 - 22 children with obesity and hypertension (average age 12.7 ± 3.7 years) and the control group 2 - 22 healthy children with normal body weight and blood pressure (average age 13.3 ± 2.9 years). The cluster of obesity and hypertension was established in 24.4% of children with obesity and in 1.5% of children in the general population.

Anthropometric indicators were determined in children: weight, height, waist circumference, body mass index (BMI), blood pressure, NO, leptin, total cholesterol (CHD), high-density lipoprotein cholesterol (HDL-C) and low-density lipoprotein cholesterol (LDL-C), triglycerides, insulin, glucose, the atherogenicity index (AI) and the HOMA-IR index were calculated. A BMI that exceeded the 95th percentile of the distribution for a given gender and age was considered a criterion for obesity in children. Values greater than the 95th percentile for a given gender, age, and height percentile were an indicator of hypertension.

Pairwise intergroup comparison of quantitative indicators was carried out using the Student's t-test, the study of the relationship between quantitative indicators was carried out using the Spearman (r) paired linear correlation.

Results. The presence of a combination of obesity and hypertension was diagnosed in 22 children, in 22.2% of children with obesity and in 1.5% of children in the general sample. BMI in children of group 1 was 28.6 ± 5.1 kg/m², group 2 - 18.1 ± 5.4 kg/m² ($p < 0.05$) (table).

Table

Clinical and biochemical indicators in children with obesity and hypertension compared to children with normal body weight and blood pressure

	Group 1	Group 2	p
Body mass, kg	86.4±20.9	50.1±13.2	<0.01
Height, cm	167.6±14.5	161.8±15.5	<0.05
Body mass index, kg/m ²	28.6±5.1	18.1±5.4	<0.05
Waist circumference, cm	94.3±11.5	68.9±7.9	<0.01
Total cholesterol, mmol/l	4.4±1.4	3.6±1.2	<0.01
LDL-C, mmol/l	2.2±0.96	1.82±0.7	<0.01
HDL-C, mmol/l	1.3±0.6	1.3±0.6	>0.05
Triglycerides, mmol/l	1.4±0.3	1.1±0.5	<0.01
IA	3.1±3.6	2.2±1.8	>0.05
Leptin, µmol/l	33.3±5.3	6.3±8.7	<0.001
Insuline, mU/l	12.8±9.5	9.5±6.9	>0.05
Glucose, mmol/l	4.6±0.8	4.5±0.7	>0.5
HOMA-IR	3.1±2.1	2.1±1.6	<0.05
NO, µmol/l	6.4±1.9	3.6 ±2.5	>0,05

Body weight, height, BMI and waist circumference in children of group 1 was probably greater than in children of group 2. The results of lipid phenotyping in children with obesity and hypertension showed pronounced dyslipidemia, the sign of which was a significant difference in the level of cholesterol (4.4±1.4 mmol/l vs 3.6±1.2 mmol/l; $p<0.01$), LDL cholesterol (2.2±0.96 mmol/l vs 1.82±0.69 mmol/l; $p<0.01$), TG (1.4±0.3 mmol/l vs 1.1±0.5 mmol/l; $p<0.01$) in comparison with the control group.

It was found that in obesity with hypertension, the level of leptin in the blood (33.3±5.3 nmol/l and 6.3±8.7 nmol/l; $p<0.05$) was 2.6 times higher than the similar indicator of healthy children with normal body weight. IA in children with hypertension and obesity was 3.1±3.6, and in 23% of children it exceeded the threshold values (>3.0). In children of the control group, IA was 1.2 times smaller than the similar indicator of group 1 (2.2±1.8).

No significant difference was found in the level of glucose and insulin in the blood serum of children of groups 1 and 2, however, a probable difference was observed in the HOMA-IR.

A positive correlation was established between the age of children with obesity and hypertension with BMI ($r=0.9$; $p<0.05$), the level of total cholesterol ($r=0.88$; $p<0.05$) and the level of LDL-C ($r=0.9$; $p<0.05$).

The level of NO in blood serum in children of groups 1 and 2 did not differ and was at the level of 6.4 ± 1.9 µmol/l and 3.6 ± 2.5 µmol/l ($p>0.05$). NO was significantly negatively correlated with AI ($r= - 0.71$; $p<0.01$), triglycerides ($r= - 0.73$; $p<0.01$). In children of the control group, the NO was positively correlated with HDL-C ($r= 0.72$; $p<0.05$).

Discussion. There is a positive correlation of age with BMI, the total cholesterol and LDL-C, that is, with the growth of children, an increase in body weight and the duration of obesity and hypertension, the proatherosclerotic indicators of lipid metabolism - total cholesterol and LDL-C increased. The obtained data indicate significant atherogenic changes in lipid metabolism and their increase over time in children with obesity and hypertension.

It was established that with an increase in body weight in children with obesity and hypertension, an increase in the level of leptin in the blood was observed. The revealed association of leptin, one of the main regulators of fat metabolism, which clearly reacts to changes in body weight, the formation of obesity, and dyslipidemia, gives grounds for asserting that hyperleptinemia is not only an independent additional component of obesity and hypertension, but also the basis of the etiopathogenesis of their development.

The level of blood NO in children with obesity and hypertension did not differ from that in children with normal body weight and blood pressure. That is, in children with components of the metabolic syndrome, such as obesity and hypertension, the synthesis of NO did not change and there were no signs of NO-associated endothelial dysfunction. It can be assumed that children with obesity and hypertension have a compensatory increase in NO synthesis in response to the action of damaging factors.

However, it was established that dyslipidemia with increased IA and hypertriglyceridemia had a significant effect on the decrease in the level of NO in children with obesity and hypertension.

The inhibitory effect of cholesterol and LDL-C on NO synthesis can be explained by the enhancement of the transcription of the caveolin gene by free cholesterol, which binds to eNOS molecules and inactivates them, by the damaging effect of dyslipidemia and directly by LDL-C on the vascular endothelium due to the increase in the expression of adhesive molecules on the surface of endothelial cells [6].

It is likely that the development of hypertension in obese children is related to the mechanosensors of endothelial cells of the vascular wall, which are displaced by the blood flow, the extent of which depends on the volumetric velocity of blood flow, blood viscosity, and vessel diameter. With the help of mechanosensors, the endothelium changes the thickness of the inner layer of the blood vessel, the mass of its muscular layer and affects blood pressure [7].

Conclusions. Blood NO in children with obesity and hypertension did not differ from its level in children with normal body weight and blood pressure. The main

factors causing NO reduction and endothelial dysfunction in children with obesity and hypertension were metabolic: dyslipidemia and hypertriglyceridemia. HDL-C cholesterol, especially in children with normal body weight, has a protective effect on the endothelium of vessels with an increase in NO synthesis.

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METHOD OF APPLICATION OF PELVIC ARCH SUPPORT OF THE ILIZAROV APPARATUS IN THE TREATMENT OF DISEASES OF THE HIP JOINT**Skvortsov A.,***Doctor of Medical Sciences**Chief Researcher**State Autonomous Healthcare Institution "Republican Clinical Hospital of the Ministry of Health of the Republic of Tatarstan"***Khabibyanov R.,***Doctor of Medical Sciences**Chief Researcher**State Autonomous Healthcare Institution "Republican Clinical Hospital of the Ministry of Health of the Republic of Tatarstan"***Gilmutdinov M.,***Candidate of Medical Sciences**Associate Professor, Department of Pediatric Surgery**Federal State Budgetary Educational Institution of**Higher Education "Kazan State Medical University"**of the Ministry of Health of Russia***Maleev M.***Candidate of Physical and Mathematical Sciences**Leading Researcher**State Autonomous Institution of Health "Republican Clinical Hospital of the Ministry of Health of the Republic of Tatarstan"***СПОСОБ НАЛОЖЕНИЯ ТАЗОВОЙ ДУГОВОЙ ОПОРЫ АППАРАТА ИЛИЗАРОВА ПРИ ЛЕЧЕНИИ ЗАБОЛЕВАНИЙ ТАЗОБЕДРЕННОГО СУСТАВА****Скворцов А.П.***Доктор медицинских наук**Главный научный сотрудник**Государственное автономное учреждение здравоохранения**«Республиканская клиническая больница Министерства**здравоохранения Республики Татарстан»***Хабибьянов Р.Я.***Доктор медицинских наук**Главный научный сотрудник**Государственное автономное учреждение здравоохранения**«Республиканская клиническая больница Министерства**здравоохранения Республики Татарстан»***Гильмутдинов М.Р.***Кандидат медицинских наук**Доцент кафедры детской хирургии**ФГБОУ ВО «Казанский государственный медицинский**университет» Минздрава России***Малеев М.В.***Кандидат физико-математических наук**Ведущий научный сотрудник**Государственное автономное учреждение здравоохранения**«Республиканская клиническая больница Министерства**здравоохранения Республики Татарстан»*<https://doi.org/10.5281/zenodo.10514617>**Abstract**

During reconstructive and restorative operations on the hip joint for its various diseases (congenital and pathological hip dislocations, aseptic necrosis, Perthes disease, etc.), it is necessary to unload the hip joint and ensure postoperative decompression of the femoral head. For this purpose, the Ilizarov apparatus is used, consisting of a pelvic arch and a pin osteofixation system.

The main disadvantages of the proposed method of fixing the arc support in the ilium are the unstable rigidity of the support fixation, clinically manifested in its two-plane mobility, and the impossibility of giving the limb an

abduction position in the hip joint, which is necessary after performing reconstructive interventions on the hip joint using the Ilizarov apparatus.

In order to eliminate this drawback, a method of applying a pelvic arc support of the Ilizarov apparatus is proposed in the treatment of diseases of the hip joint. For the purpose of osteofixation, we chose a hybrid system, which in clinical practice has shown its advantages over existing wire structures.

Аннотация

При реконструктивно-восстановительных операциях на тазобедренном суставе при его различных заболеваниях (врожденный и патологический вывихи бедра, асептические некрозы, болезнь Пертеса и т.д.) необходима разгрузка тазобедренного сустава и обеспечение послеоперационной декомпрессии головки бедренной кости. С этой целью применяется аппарат Илизарова, состоящий из тазовой дуги и спицевой системы остеофиксации.

Главными недостатками предложенного способа фиксации дуговой опоры в подвздошной кости являются нестабильная жесткость фиксации опоры, клинически проявляющаяся в двухплоскостной ее подвижности, и невозможность придания конечности положения отведения в тазобедренном суставе, что необходимо после выполнения реконструктивных вмешательств на тазобедренном суставе с использованием аппарата Илизарова.

С целью устранения этого недостатка предлагается способ наложения тазовой дуговой опоры аппарата Илизарова при лечении заболеваний тазобедренного сустава. В целях остеофиксации нами выбрана гибридная система, которая в клинической практике показала свои преимущества по сравнению с существующими спицевыми конструкциями.

Keywords: hip joint, surgical treatment, external fixation device

Ключевые слова: тазобедренный сустав, хирургическое лечение, аппарат внешней фиксации

При лечении различных заболеваний тазобедренного сустава (врожденный и патологический вывихи бедра, асептические некрозы, болезнь Пертеса и т.д.) необходима разгрузка тазобедренного сустава и обеспечение послеоперационной декомпрессии головки бедренной кости. Кроме того, при реконструкции бедренной кости по Илизарову, при врожденном вывихе бедра, у взрослых необходимо низведение бедренной кости. С этой целью применяется аппарат Илизарова, состоящий из тазовой дуги и кольцевой опоры [1, с. 11; 2, с. 14; 3, с. 24]. Тазовую дугу аппарата Илизарова накладывают на подвздошную кость на 3-5 перекрещивающихся на разных уровнях спицах, с упорными площадками навстречу друг другу, а кольцевую опору накладывают на спицах на дистальный метафиз бедренной кости. Дугу и кольцевую опору аппарата соединяют тремя резьбовыми штангами.

Данная компоновка аппарата Илизарова позволяет производить разгрузку и декомпрессию в тазобедренном суставе, а при необходимости и низведение бедра, путем дистракции по опорам между тазовой дугой и кольцевой опорой аппарата, наложенной на бедро.

Применяемый нами ранее аппарат Илизарова, [3, с.24; 4, с. 129], включающая в себя фиксацию тазовой дуги аппарата Илизарова на 3 перекрещивающихся натянутых спицах таким образом, чтобы спицы проходили вдоль плоскости подвздошной кости. При этом дуговая опора аппарата Илизарова занимает положение под углом 45-50° к горизонтальной плоскости. Главными недостатками способа одноплоскостной фиксации дуговой опоры в подвздошной кости являются нестабильная жесткость фиксации опоры, клинически проявляющаяся в двухплоскостной ее подвижности, и невозможность придания конечности положения отведения в тазобедренном суставе, что необходимо после вы-

полнения реконструктивных вмешательств на тазобедренном суставе с использованием аппарата Илизарова.

Для достижения жесткой стабильной фиксации тазовой дуговой опоры аппарата Илизарова, через подвздошную кость проводят перекрещивающиеся спицы и фиксируют их на упомянутой опоре, через надацетабулярную область крыла подвздошной кости проводят внутрикостный стержень и фиксируют его на упомянутой опоре. Проведение одной из упомянутых спиц осуществляют в передне-верхнюю ость крыла подвздошной кости с выходом спицы через задне-нижнюю ость названной кости, а другой - в передне-нижнюю ость с выходом спицы через задне-верхнюю ость крыла подвздошной кости. Фиксацию упомянутых спиц на опоре осуществляют с помощью спицефиксаторов и выносных кронштейнов, а фиксацию упомянутого стержня на упомянутой опоре осуществляют с помощью выносного кронштейна и гаек.

Проведение спицы через передне-верхнюю ость крыла подвздошной кости с выходом ее через задне-нижнюю ость крыла названной кости, а другой - через передне-нижнюю ость - с выходом через задне-верхнюю ость крыла подвздошной кости обеспечивает четкую ориентацию при проведении спиц по указанным анатомическим образованиям подвздошной кости. Эти образования легко пальпируются, являются наиболее плотными и массивными. Именно проведение спиц в толще массива кости снижает риск повреждения внутренних органов таза. С другой стороны, при таком проведении точки крепления спиц к опорам и точки входа в кость (выхода из кости) максимально приближены, а кость охватывает максимально возможные по длине участки спиц, что обеспечивает наибольшую жесткость и стабильность фиксации тазовой дуговой опоры. Такая фиксация особенно важна при

врожденных и длительно существующих заболеваниях тазобедренного сустава, когда подвздошная кость, лишенная адекватной нагрузки, подвержена выраженным остеопорозным изменениям.

Использование выносных кронштейнов со спицефиксаторами, для крепления упомянутых спиц на опоре, позволяет обеспечить строго перпендикулярное по отношению к фронтальной плоскости положение опоры. Такое положение тазовой опоры обеспечивается установкой плоскости упомянутой опоры вдоль линии, мысленно проведенной через передне-верхние ости костей таза слева и справа. Именно монтаж тазовой опоры строго перпендикулярно фронтальной плоскости обеспечивает разгрузку тазобедренного сустава и необходим при послеоперационной декомпрессии головки бедренной кости или при низведении головки бедренной кости. Он биомеханически целесообразен, так как при такой установке дистракционные усилия прикладываются вдоль резьбовых штанг.

Монтаж тазовой опоры строго перпендикулярно фронтальной плоскости предотвращает касание мягких тканей штангами аппарата. При установке на бедре опоры меньшего размера, чем тазовая опора, соединение упомянутых опор осуществляется посредством параллельно расположенных штанг. Эта параллельность обеспечивается применением выносных планок, устанавливаемых на бедренной опоре.

Проведение внутрикостного стержня через надацетабулярную область крыла подвздошной кости, являющуюся плотным и массивным образованием, обеспечивает надежную фиксацию самого стержня в кости. При такой установке стержня, по отношению к спицам, пространственно разносятся точки фиксации тазовой опоры на подвздошной кости, в результате чего происходит усиление жесткости фиксации самой тазовой дуговой опоры аппарата Илизарова на этой кости.

Общий вид аппарата представлен на рис.1 (прямая проекция) и 2 (боковая проекция).

На рис.1 и 2 изображена тазовая опора аппарата Илизарова 1, наложенная на подвздошную кость 2. Тазовая опора аппарата Илизарова 1 фиксируется на спицах 3 и 4. Спица 3 проведена через передне-верхнюю ость крыла подвздошной кости и, проходя через толщу подвздошной кости, выходит через задне-нижнюю ость той же кости. Другая спица 4 проведена через передне-нижнюю ость и, также проходя через толщу подвздошной кости, выходит через задне-верхнюю ость. Спицы фиксируются с помощью штатных спицефиксаторов и выносных кронштейнов аппарата Илизарова. Для большей наглядности схема проведения спиц показана в двух (прямой и боковой) проекциях (рис.1, 2).

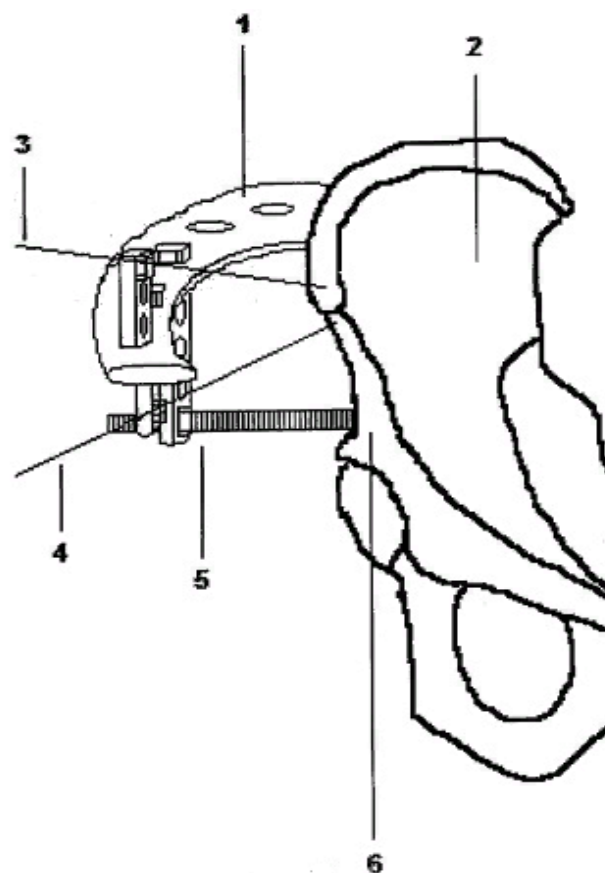


Рис. 1. Тазовая опора аппарата Илизарова, наложенная на подвздошную кость (прямая проекция).

Дополнительно тазовая опора 1 фиксируется внутрикостным стержнем 5, проведенным через надацетабулярную область крыла подвздошной кости 6.

Фиксация тазовой опоры 1 на внутрикостном стержне 5 осуществляется с помощью выносного кронштейна и гаек (не показаны).

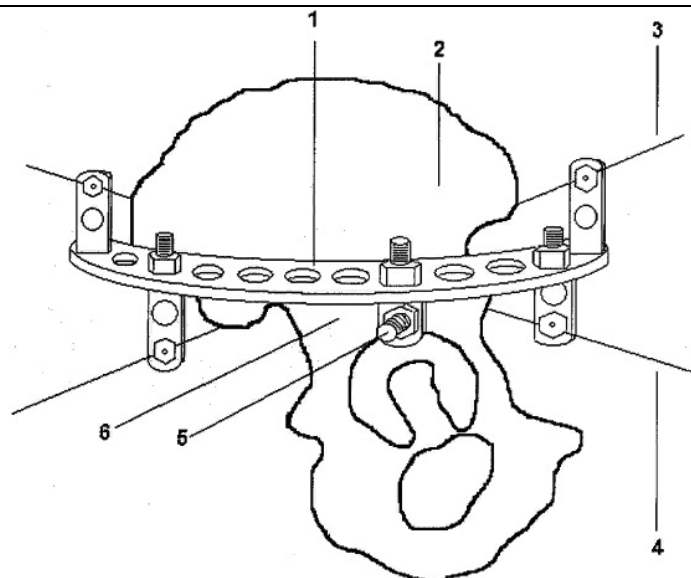


Рис. 2. Тазовая опора аппарата Илизарова, наложенная на подвздошную кость (боковая проекция).

Тазовая опора используется следующим образом. Положение больного на операционном столе - на боку. С помощью дрели проводится спица 3 через передне-верхнюю ость крыла подвздошной кости (определяется пальпаторно) и после прохождения через толщу подвздошной кости спица выходит через задне-нижнюю ость крыла той же кости. Вторая спица 4 аналогичным образом проводится через

передне-нижнюю ость и также после прохождения через толщу подвздошной кости выходит через задне-верхнюю ость крыла этой кости. Спицы фиксируются с помощью штатных спицефиксаторов и выносных кронштейнов аппарата Илизарова таким образом, чтобы тазовая опора приняла свое положение строго в горизонтальной плоскости.



Рис. 3. Общий вид аппарата на пациенте:

А - тазовая опора аппарата Илизарова, наложенная на подвздошную кость, Б - рентгенограмма

Для дополнительной фиксации тазовой опоры 1 используется внутрикостный стержень 5, проведенный через надацетабулярную область крыла подвздошной кости 6, и закрепляется с помощью штатного выносного кронштейна и гаек (рис.3 а,б).

При применении разработанного способа наложения тазовой дуговой опоры даже при значительных дистракционных усилиях (низведение головки бедра при высоком вывихе) отмечается её жесткая стабильная фиксация, что позволяет применять его в широкой клинической сети при реконструктивных операциях на тазобедренном суставе.

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X-RAY MYOGRAPHIC STUDY OF MUSCLES IN PATIENTS WITH VARIOUS DISEASES OF THE HIP JOINT**Skvortsov A.,***Doctor of Medical Sciences**Chief Researcher**State Autonomous Healthcare Institution "Republican Clinical Hospital of the Ministry of Health of the Republic of Tatarstan"***Khabibyanov R.,***Doctor of Medical Sciences**Chief Researcher**State Autonomous Healthcare Institution "Republican Clinical Hospital of the Ministry of Health of the Republic of Tatarstan"***Gilmutdinov M.,***Candidate of Medical Sciences**Associate Professor, Department of Pediatric Surgery**Federal State Budgetary Educational Institution of**Higher Education "Kazan State Medical University"**of the Ministry of Health of Russia***Maleev M.***Candidate of Physical and Mathematical Sciences**Leading Researcher**State Autonomous Institution of Health "Republican Clinical Hospital of the Ministry of Health of the Republic of Tatarstan"***РЕНТГЕНОМИОГРАФИЧЕСКОЕ ИССЛЕДОВАНИЕ МЫШЦ У ПАЦИЕНТОВ ПРИ РАЗЛИЧНЫХ ЗАБОЛЕВАНИЯХ ТАЗОБЕДРЕННОГО СУСТАВА****Скворцов А.П.***Доктор медицинских наук**Главный научный сотрудник**Государственное автономное учреждение здравоохранения «Республиканская клиническая больница Министерства здравоохранения Республики Татарстан»***Хабибьянов Р.Я.***Доктор медицинских наук**Главный научный сотрудник**Государственное автономное учреждение здравоохранения «Республиканская клиническая больница Министерства здравоохранения Республики Татарстан»***Гильмутдинов М.Р.***Кандидат медицинских наук**Доцент кафедры детской хирургии**ФГБОУ ВО «Казанский государственный медицинский университет» Минздрава России***Малеев М.В.***Кандидат физико-математических наук**Ведущий научный сотрудник**Государственное автономное учреждение здравоохранения «Республиканская клиническая больница Министерства здравоохранения Республики Татарстан»*<https://doi.org/10.5281/zenodo.10514623>**Abstract**

Functional insufficiency of the abductor muscles of the thigh in pathology of the hip joint is manifested by the Duchenne-Trendelenburg symptom (inability to keep the pelvis from lateral tipping during a single-support period of standing). Insufficiency of the abductor muscles of the hip, which is the cause of impaired support ability and gait, occurs in various diseases of the hip joint, therefore its preoperative and postoperative determination is of great importance both in the correct choice of treatment for patients and in terms of prognosis of the adequacy of the applied treatment method. The authors proposed a method for x-ray myographic examination of muscles in patients with various diseases of the hip joint. Conducting an X-ray contrast study of the abductor muscles of the

thigh allows us to obtain additional valuable information about the condition of these muscles, about changes in their shape, structure, points of attachment, degree of atrophy, which is necessary to know when planning surgical interventions in the area of work of the muscles, and also allows for a timely course of drug treatment, electrical stimulation, physical therapy with dosed training of weakened and atrophic muscles.

Аннотация

Функциональная недостаточность отводящих мышц бедра при патологии тазобедренного сустава проявляется симптомом Дюшена-Тренделенбурга (неспособность удерживать таз от бокового опрокидывания в одноопорный период стояния). Недостаточность отводящих мышц бедра, являющаяся причиной нарушения опороспособности и походки, встречается при различных заболеваниях тазобедренного сустава, поэтому её дооперационное и послеоперационное определение имеет большое значение как в правильности выбора лечения пациентов, так и в плане прогноза адекватности примененной методики лечения. Авторами предложен метод рентгеномиографического исследования мышц у пациентов при различных заболеваниях тазобедренного сустава. Проведение рентгеноконтрастного исследования отводящих мышц бедра позволяет получить дополнительную ценную информацию о состоянии этих мышц, об изменении их формы, структуры, точек прикрепления, степени атрофии, что необходимо знать при планировании оперативных вмешательств в зоне работы мышц, а также позволяет своевременно проводить курс медикаментозного лечения, электростимуляции, лечебной физкультуры с дозированной тренировкой ослабленных и атрофичных мышц.

Keywords: pathology of the hip joint, X-ray contrast study of the hip abductors

Ключевые слова: патология тазобедренного сустава, рентгеноконтрастное исследование отводящих мышц бедра

При исследовании мышечной системы нижних конечностей особенно пристальное внимание обращают на себя отводящие мышцы бедра, среди которых ведущее место в опороспособности занимает средне-ягодичная мышца бедра. В клинической практике функциональная недостаточность отводящих мышц бедра при патологии тазобедренного сустава проявляется симптомом Дюшена-Тренделенбурга (неспособность удерживать таз от бокового опрокидывания в одноопорный период стояния). Недостаточность отводящих мышц бедра, являющаяся причиной нарушения опороспособности и походки, встречается при различных заболеваниях тазобедренного сустава.

Основными методами исследования недостаточности ягодичных мышц являются электромиография, динамометрия, которые косвенно отражают функциональную недостаточность этих мышц, однако они не позволяют выявлять степень их органического поражения. Использование гистологического метода исследования (биопсия) позволяет выявить изменения структуры мышц, но не дает возможности оценить анатомо-топографические характеристики отводящих мышц бедра (форма и размеры мышечного брюшка и изменения их в зависимости от положения большого вертела). Учитывая, что отводящие мышцы бедра начинаются широким основанием на подвздошной кости, а их мышечные пучки сходятся к общим конечным сухожилиям, прикрепляющимся к большому вертелу бедренной кости, методика рентгеноконтрастного исследования имеет свои особенности по сравнению со стандартной рентгеномиографией.

В качестве контрастного вещества использовали верографин, разведенный изотоническим раствором хлорида натрия до 30-35%. Раствор вводили в среднюю треть брюшка среднеягодичной мышцы на больной и здоровой стороне. Количество раствора, вводимого детям, - 6-10 мл. Контрастное ве-

щество вводили на глубину 2-2,5 см из точки, расположенной на 2-5 см выше большого вертела (в зависимости от возраста). На контрастной рентгеномиограмме в норме средне-ягодичная мышца имеет форму равностороннего треугольника; мышечные пучки образуют "расправленный веер" с точкой прикрепления в области большого вертела, заканчивающийся по дугообразной линии на подвздошной кости. При различных заболеваниях тазобедренного сустава форма и размеры среднеягодичной мышцы были обусловлены величиной смещения большого вертела кверху относительно линии Розена-Нелатона. В результате сближения точек прикрепления мышц (большой вертел и крыло подвздошной кости) изменялась ее форма - она становилась неопределенной, резко атрофированной, терялась граница ее брюшка. В структуре мышцы отмечаются органические изменения диффузного характера, происходило ее неравномерное контрастирование, она резко уменьшалась в размерах. Атрофия мышцы определялась [1, с. 15] в зависимости от разницы между величиной ягодичной поверхности крыла и величиной основания прикрепления контрастируемой мышцы к наружной поверхности подвздошной кости. В норме величина основания прикрепления отводящих мышц бедра точно соответствует величине ягодичной поверхности крыла подвздошной кости. Если размер основания прикрепления мышцы составляет более 70% ягодичной поверхности крыла, то атрофия умеренно выражена, от 70 до 50% - характеризуется как выраженная атрофия, а при размере основания отводящих мышц менее 50% - атрофия характеризуется как резко выраженная.

На рис. 1а представлена рентгеномиография, выполненная до оперативного лечения. В процессе формирования ПОБК и его низведения (до вправления в вертлужную впадину) наблюдается восстановление структуры и формы средне-ягодичной

мышцы - появление перечисленных выше признаков (рис. 1б). Восстановление структуры и формы средне-ягодичной мышцы отмечается после окончания лечения (рис. 1в), что подтверждается данными рентгеномиографии на здоровой стороне.

Рентгенологическая картина восстановления средне-ягодичной мышцы после окончания лечения согласовывалась с клиникой (отсутствие симптома Тренделенбурга) и подтверждается результатами электромиографии.

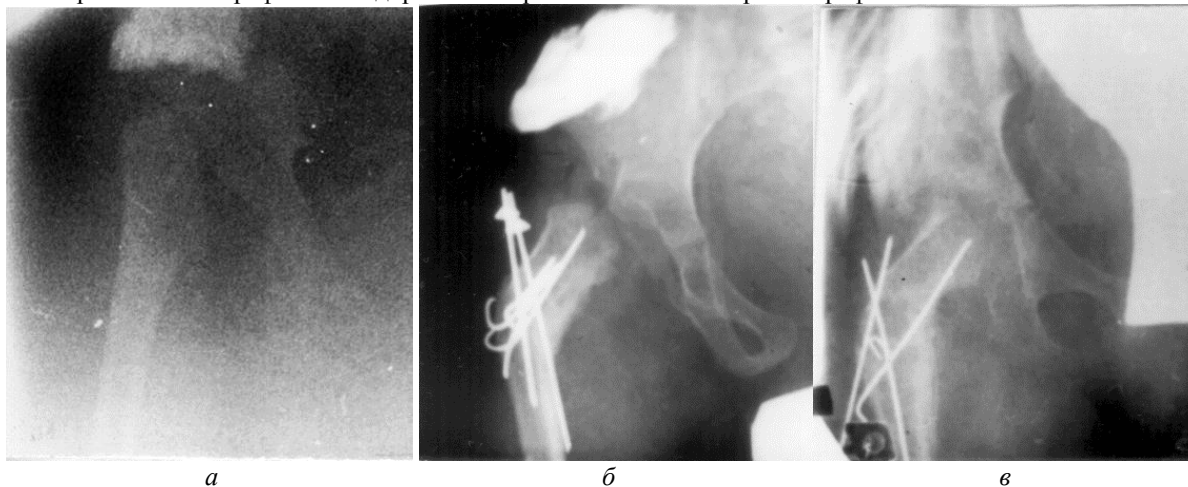


Рис. 1.

Рентгеномиография: а – до операции; б – в процессе формирования проксимального отдела бедренной кости; в – после открытого вправления и коррекции углов ПОВК (Б-ной С-ев Н., 5 лет, и/б № 2675).

Метод достаточно информативен, прост в исполнении. Однако не во всех случаях удается получить контрастирование структуры даже здоровой мышцы, а функциональное изменение её линейных параметров метод не предусматривает.

Поэтому способ применялся нами в некоторой модификации [2, с. 11], а именно: после введения контрастного вещества в брюшко исследуемой мышцы больному дают статическую или функциональную нагрузку на исследуемую конечность в течение 1 минуты, затем выполняют рентгенографию тазобедренных суставов в фасной и аксиальной проекциях, а также в положении отведения с максимальной внутренней ротацией конечности (по Ланге).

Проведение функциональной или статической нагрузки на сустав сокращает время исследования и улучшает распространение контрастного веще-

ства по всей толще мышцы за счет усиления кровотока в мышце при нагрузке. Проведение исследования в трех проекциях предусмотрено общепринятой тактикой ортопедического обследования больных с патологией тазобедренного сустава, что не требует увеличения лучевой нагрузки на больного. Изменение же линейных параметров мышцы в различных положениях конечностей позволяет в сравнительном (со здоровой стороной) аспекте оценить степень функциональной растяжимости мышцы и провести предоперационный расчет степени необходимой коррекции ягодичных мышц. В послеоперационном периоде изменения формы, структуры мышц и линейных параметров позволяет определить степень травматичности проведенного вмешательства, его эффективность и проследить этапы нормализации мышечной ткани (средне-ягодичной мышцы), что показательно при восстановлении опороспособности конечности (рис. 2 а, б).

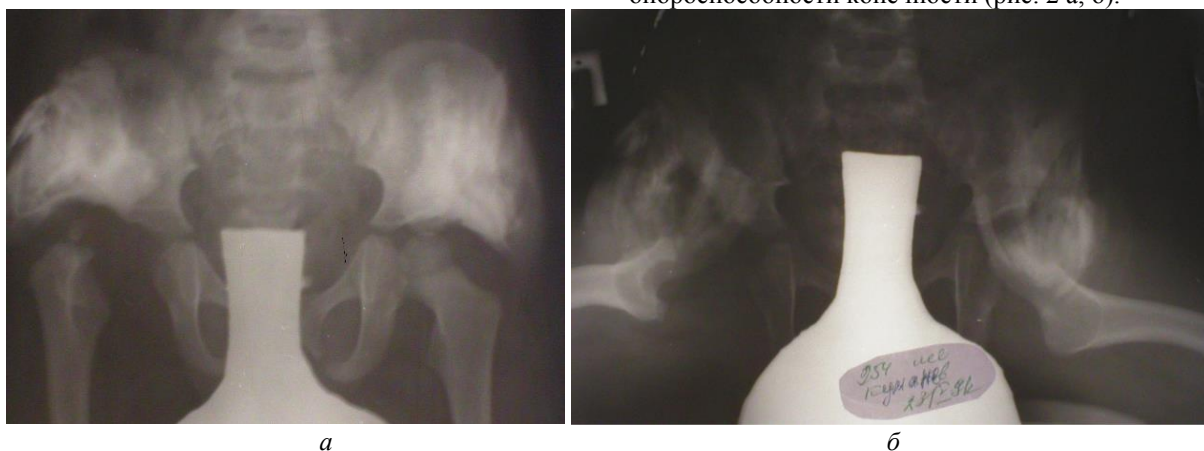


Рис. 2. Рентгеномиография, выполненная по патенту №2042337 (Б-ной К-нев, 4 года, и/б № 4371).

Способ осуществляют следующим образом [3, с.15]. В рентгеновском кабинете при положении больного лежа на рентгеновском столе с соблюдением требований асептики иглой для внутримышечных инъекций производят пункцию брюшка, например средней ягодичной мышцы (на 2-5 см выше уровня вершины большого вертела), с таким расчетом, чтобы конец иглы располагался в толще мышечного брюшка. Вводят с обычной скоростью водорастворимое контрастное вещество (верографин, урографин и т.п.), разведенное в соотношении 1:1 в 0,5%-ном растворе новокаина. Объем вводимого раствора составляет 10-15 мл в зависимости от возраста больного, что составляет 1/4 около 20 объема мышцы. Введение контрастного вещества производят и со здоровой стороны по той же методике. Рентгенография проводится через 1 мин. после введения контрастного вещества. В течение 1 минуты больному предлагается произвести несколько приседаний или серию сгибательных и отводящих движений в тазобедренном суставе (если нагрузка на конечности не разрешена).

Рентгенографию проводят в положении больного лежа на спине с вытянутыми и сведенными нижними конечностями в передне-задней фасной проекции. Вторую рентгенограмму проводят в положении отведения с максимальной внутренней ротацией бедер (для определения центрации головок бедренных костей относительно вертлужной впадины). Третью рентгенограмму - в положении Рипштейна (больной лежит на спине, нижние конечности в коленных и тазобедренных суставах согнуты под углом 90°. Отведение бедер в тазобедренных суставах 30°). Последняя рентгенограмма позволяет определить угол патологической торсии проксимального отдела бедра. При всех этих проекциях наложение тени костей на тень мышцы исключается.

Введение контрастного вещества малоболезненно, не оказывает повреждающего влияния на мышечную ткань и может быть применено при необходимости повторно на дальнейших этапах лечения.

Предлагаемый способ может быть применен при заболеваниях тазобедренного сустава, связанных с нарушением его биомеханики и изменения мышечного компонента.

Проведение рентгеноконтрастного исследования отводящих мышц бедра позволяет получить дополнительную ценную информацию о состоянии этих мышц, об изменении их формы, структуры точек прикрепления, степени атрофии, что необходимо знать при планировании оперативных вмешательств в зоне работы мышц, а также позволяет своевременно проводить курс медикаментозного лечения, электростимуляции, лечебной физкультуры с дозированной тренировкой ослабленных и атрофичных мышц.

В процессе лечения наблюдается восстановление формы, структуры и длины мышцы, однако полноценного анатомического рисунка, соответствующего здоровой стороне, достичь не удаётся. С возрастом ребенка и увеличением времени, прошедшего после операции, структура мышечного рисунка восстанавливается на 75-85%. Это полностью согласуется с функциональными результатами (отсутствие симптома Тренделенбурга) и подтверждается результатами электромиографии.

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FOOT BAR FOR COMPENSATION FOR LIMB SHORTENING AND FOOT RETENTION**Skvortsov A.,***Doctor of Medical Sciences**Chief Researcher**State Autonomous Healthcare Institution "Republican Clinical Hospital of the Ministry of Health of the Republic of Tatarstan"***Khabibyanov R.,***Doctor of Medical Sciences**Chief Researcher**State Autonomous Healthcare Institution "Republican Clinical Hospital of the Ministry of Health of the Republic of Tatarstan"***Gilmutdinov M.,***Candidate of Medical Sciences**Associate Professor, Department of Pediatric Surgery**Federal State Budgetary Educational Institution of**Higher Education "Kazan State Medical University"**of the Ministry of Health of Russia***Maleev M.***Candidate of Physical and Mathematical Sciences**Leading Researcher**State Autonomous Institution of Health "Republican Clinical Hospital of the Ministry of Health of the Republic of Tatarstan"***СТОПОДЕРЖАТЕЛЬ ДЛЯ КОМПЕНСАЦИИ УКОРОЧЕНИЯ КОНЕЧНОСТИ И УДЕРЖАНИЯ СТОПЫ****Скворцов А.П.***Доктор медицинских наук**Главный научный сотрудник**Государственное автономное учреждение здравоохранения «Республиканская клиническая больница Министерства здравоохранения Республики Татарстан»***Хабибьянов Р.Я.***Доктор медицинских наук**Главный научный сотрудник**Государственное автономное учреждение здравоохранения «Республиканская клиническая больница Министерства здравоохранения Республики Татарстан»***Гильмутдинов М.Р.***Кандидат медицинских наук**Доцент кафедры детской хирургии**ФГБОУ ВО «Казанский государственный медицинский университет» Минздрава России***Малеев М.В.***Кандидат физико-математических наук**Ведущий научный сотрудник**Государственное автономное учреждение здравоохранения «Республиканская клиническая больница Министерства здравоохранения Республики Татарстан»*<https://doi.org/10.5281/zenodo.10514650>**Abstract**

Law G.A. Ilizarov states that "the structure, shape and volume of the musculoskeletal system is determined by the load." Accordingly, the load on the operated limb during the formation of a distraction regenerate during lengthening or healing of a bone fracture should be carried out after the end of the pain syndrome on days 4-5 after osteosynthesis. When a dosed load is applied to the limb, microcirculation of the limb is restored, the process of consolidation of fragments is optimized, in other words, dosed axial load is an important part of rehabilitation.

In addition, after application of the Ilizarov apparatus for various injuries and diseases of the lower limb (in particular, with shortening of the limb segment), a frequent complication is the development of equinus deformity of the foot. This occurs especially often when segments of the lower limb lengthen and shorten. Prevention of this

type of postoperative complication is to position the patient's foot in relation to the axis of the leg at an angle of 90° and hold it in this position for the entire period of lengthening the limb segment. The authors have developed and used in the clinic an orthopedic foot support, the purpose of which is to prevent delayed consolidation of fragments by restoring the physiological load on the operated limb and preventing the development of an equinus position of the foot.

Аннотация

Закон Г.А. Илизарова гласит, что «структуру, форму и объем опорно-двигательной системы определяет нагрузка». Соответственно нагрузка на оперированную конечность при формировании дистракционного регенерата при удлинении или сращении перелома костей должна осуществляться после окончания болевого синдрома на 4-5 сутки после произведенного остеосинтеза. При осуществлении дозированной нагрузки на конечность восстанавливается микроциркуляция конечности, оптимизируется процесс консолидации отломков, иначе говоря, дозированная осевая нагрузка – важная часть реабилитации.

Кроме того, после наложения аппарата Илизарова при различных травмах и заболеваниях нижней конечности (в частности, при укорочении сегмента конечностей) частым осложнением является развитие эквинусной деформации стопы. Особенно часто это происходит при удлинении сегментов нижней конечности при их укорочении. Профилактикой этого вида послеоперационного осложнения является установка стопы пациента по отношению к оси голени под углом 90° и удержание её в такой позиции на весь период удлинения сегмента конечности. Авторами разработан и применен в клинике ортопедический подстопник, предназначением которого является предупреждение замедленной консолидации отломков путем восстановления физиологической нагрузки на оперированную конечность и профилактика развития эквинусной установки стопы.

Keywords: equinus foot deformity, prevention

Ключевые слова: эквинусная деформации стопы, профилактика

Исходя из законов Г.А. Илизарова, изложенных как «*общебиологические закономерности*» [1, с.8] об «адекватности кровоснабжения и нагрузок» и закона о том, что «структуру, форму и объем опорно-двигательной системы определяет нагрузка» и их клиническим требованиям, что нагрузка на оперированную конечность при формировании дистракционного регенерата при удлинении или костной мозоли при переломе кости должна осуществляться после окончания болевого синдрома на 4-5 сутки после произведенного остеосинтеза. Для осуществления дозированной нагрузки на конечность необходимо использование специального подстопника, предназначением которого является компенсация укорочения сегмента конечности.

Кроме того, после наложения аппарата Илизарова, при различных травмах и заболеваниях нижней конечности (в частности, при укорочении сегмента нижней конечности) частым осложнением является развитие эквинусной деформации стопы. Особенно часто это происходит при удлинении сегментов нижней конечности. Профилактикой этого вида послеоперационного осложнения является установка всевозможных подстопников с применением эластичных тяг [2, с. 12]. В случае укорочения сегмента высота подстопника выполняется равной укорочению [3, с.27]. Обычно с целью уменьшения веса конструкции используется пенопласт. По мере удлинения сегмента подстопник из пенопласта подрезается на требуемую высоту. После наложения аппарата Илизарова больным на 4-5 день разрешается ходьба с дозированной нагрузкой (15-20 кг). Ощущение такой нагрузки больные отрабатывают на напольных весах.

Стоподержатель [4, с.9] для компенсации укорочения конечности и удержания стопы в правиль-

ном положении в послеоперационном периоде после остеосинтеза содержит основание, супинационную стельку и эластичные тяги для крепления к аппарату Илизарова. На основании установлены вертикально и жестко закреплены в нем резьбовые направляющие штыри, один из которых расположен у края по середине короткой стороны основания, а два других - по углам вдоль второй короткой стороны. На штырях размещены распорки, количество которых подбирается таким образом, чтобы суммарная высота соответствовала величине компенсируемого укорочения конечности. Блок чувствительного элемента состоит из подложки, по центру которой закреплен тензодатчик, и пластинчатой пружины изгиба прямоугольной формы. Тензодатчик и пластинчатая пружина соединены между собой отогнутыми лапками подложки. Супинационная стелька состоит из жесткой пластины с элементами крепления к ноге и тремя вертикальными выступами по трем сторонам для крепления эластичных тяг, и собственно супинационной стельки. При этом супинационная стелька зафиксирована на штырях гайками, с возможностью возвратно-поступательных движений, без напряжения пружины изгиба. Пластинчатые пружины имеют по своим коротким сторонам овальные пазы под направляющие штыри, ориентированные вдоль их длинных сторон, обеспечивающие полное распрямление пружины под нагрузкой.

Стоподержатель имеет набор тарированных пластинчатых пружин, рассчитанных для использования в различные послеоперационные периоды.

Тензодатчик через преобразователь сигнала соединен с наушником.

Вертикальная установка по трем сторонам с жестким закреплением в основании резьбовых направляющих штырей предусмотрена для прида-

ния конструкции устойчивости и возможности изменения высоты подстопника в строгой зависимости от величины укорочения сегмента конечности.

Наборные распорки устанавливаются на штырях, устраняют перекося таза, а высота их подбирается и соответствует величине компенсируемого укорочения конечности. Исполнение распорки, применяемой при минимальном укорочении конечности составной, состоящей из двух одинаковых, небольших по габаритам деталей, делает ее универсальной, что позволяет изготавливать ее из более прочного, чем пенопласт, материала и использовать многократно.

Наличие блока чувствительного элемента, состоящего из подложки, с закрепленным на ней тензодатчиком и пластинчатой пружины изгиба позволяет дозировать нагрузку на конечность подбором соответствующей пружины и извещать больного о превышении нагрузки на оперированную конечность. Применение в конструкции супинационной стельки, состоящей из жесткой пластины с элементами крепления к ноге и выступами с отверстиями по трем сторонам, и собственно супинационной стельки, является профилактической мерой для предотвращения развития посттравматического плоскостопия. Жесткая пластина исключает деформацию супинационной стельки в процессе эксплуатации.

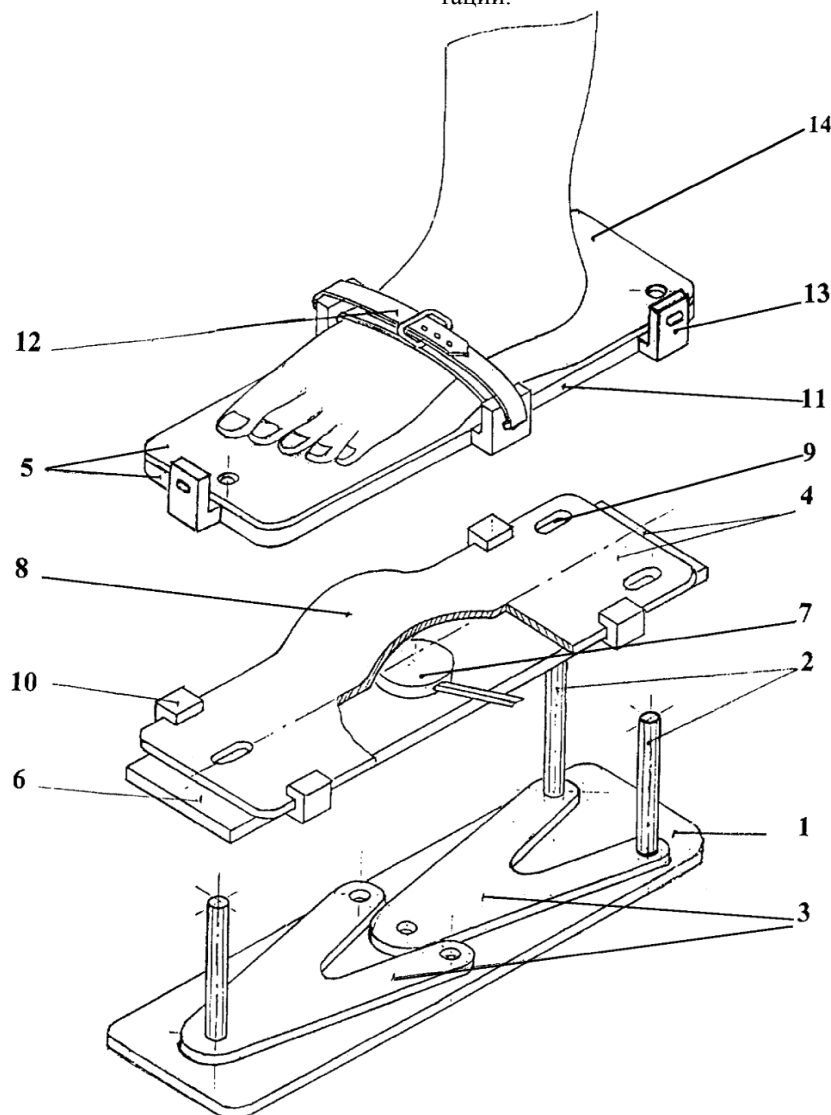


Рис. 1. Стоподержатель [4, с.11]

Вертикальные выступы с отверстиями предусмотрены для крепления эластичных тяг, фиксирующих стельку относительно колец аппарата Илизарова, чем устраняется провисание стопы, и предотвращается развитие эквинусной позиции стопы в послеоперационном периоде.

Использование резьбовых штырей, жестко установленных на основании, для фиксации стельки гайками, обеспечивает единство конструк-

ции без напряжения пружины изгиба, т.е. возможность возвратно-поступательных движений стельки при различном количестве распорок на штырях.

Фиксация стельки без напряжения плоской пружины, с возможностью возвратно-поступательных движений обеспечивает дозирование нагрузки на конечность: при переносе веса тела на оперированную ногу пластинчатая пружина распрямляется,

что обеспечивают пазы под стержни вдоль ее длинных сторон. При максимальном дозированном значении нагрузки пружина распрямляется и воздействует на тензодатчик, который выдает предостерегающий сигнал в наушник.

Стоподержатель имеет в своем комплекте набор тарированных пластинчатых пружин, рассчитанных для использования в различные послеоперационные периоды. Это обусловлено тем, что после образования первичной костной мозоли или формирования регенерата нагрузку на конечность необходимо увеличивать.

Стоподержатель снабжен тензодатчиком и через преобразователь сигнала соединен с наушником. Применение тензодатчика с наушником освобождает больного от процесса запоминания дозированной нагрузки.

Общий вид стоподержателя с разнесенными в пространстве узлами представлен на чертеже.

Стоподержатель (рис. 1) состоит из основания 1, на котором жестко установлены резьбовые направляющие штыри 2. На штырях 2 последовательно установлены наборные распорки 3, блок чувствительного элемента 4 и супинационная стелька 5.

Блок чувствительного элемента 4 состоит из подложки 6 с закрепленным на ней тензодатчиком 7 и пластинчатой пружины 8 с пазами 9, соединенных между собой отогнутыми лапками 10 подложки 6.

Супинационная стелька 5 состоит из жесткой пластины 11 с элементами крепления к ноге 12 и тремя вертикальными выступами с отверстиями 13 и собственно супинационной стельки 14.

Стоподержатель для компенсации укорочения конечности и удержания стопы применяют следующим образом.

В предоперационном периоде, после сравнительных рентгенограмм здорового и укороченного сегментов определяется величина укорочения по-

врежденного сегмента. Учитывая величину укорочения, производится сборка стоподержателя по следующей схеме. На штыри 2 основания 1 надевается необходимое количество наборных распорок 3 таким образом, чтобы их суммарная высота вместе с подложкой 6 и жесткой пластиной 11 была равна величине укорочения сегмента конечности. После чего на штыри 2 овальными пазами 9 устанавливается блок чувствительного элемента 4, состоящий из подложки 6 с лапками 10, пластинчатой пружины 8 и тензодатчика 7. После этого на блок чувствительного элемента 4 на штыри 2 устанавливается супинационная стелька 5, состоящая из жесткой пластины 11 с элементами крепления к ноге 12, вертикальными выступами 13 и собственно супинационной стельки 14. Стоподержатель крепится к стопе больного с помощью элементов крепления к ноге 12, а к кольцу аппарата Илизарова - эластичными тягами (не показаны) за вертикальные выступы с отверстиями 13 жесткой пластины 11.

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PEDAGOGICAL SCIENCES

MUSICAL INTERPRETATION AS A MANIFESTATION OF THE ARTISTIC ABILITY OF ATHLETES IN SPORTS AEROBICS

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МУЗИЧНА ІНТЕРПРЕТАЦІЯ ЯК ПРОЯВ АРТИСТИЧНИХ ЗДІБНОСТЕЙ СПОРТСМЕНІВ У СПОРТИВНІЙ АЕРОБІЦІ

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Abstract

The interpretation of musical works is a complex multifaceted process that contains huge opportunities for athletes to reveal and realize their performing abilities and skills, creative potential and reflection of the acquired artistic experience. The interpretation of musical works allows the athlete to deeply understand the artistic concept and creatively reproduce it in his own performance, demonstrating artistry at the highest level.

Анотація

Інтерпретація музичних творів є складним багатоаспектним процесом, що містить величезні можливості для вияву і реалізації спортсменами виконавських здібностей та умінь, творчого потенціалу та віддзеркалення набутого художнього досвіду. Інтерпретація музичних творів дозволяє спортсмену глибоко зрозуміти художньо-образний задум та творчо його відтворити у власному виконанні, продемонструвавши артистизм на самому високому рівні.

Keywords: artistic ability, the interpretation of musical works, sport aerobic

Ключові слова: артистичні здібності, інтерпретація музичних творів, спортивна аеробіка

Спортивна аеробіка - це вид спорту, в якому спортсмени виконують безперервну і високо інтенсивну вправу, що включає поєднання ациклічних рухів зі складною координацією та елементами складності, а також взаємодію між музикальним супроводом та виконанням хореографії, яка складається традиційно для аеробіки з "базових" аеробних кроків і їх різновидів.

Цей вид спорту містить елементи спортивної та художньої гімнастики, спортивної акробатики і є одним з найдинамічніших, емоційних, видовищних видів спорту, який вимагає граничного прояву фізичних, психологічних якостей і техніко-тактичних умінь. Характерним для спортивної аеробіки є використання музикального супроводу, який є прикрасою композиційної постанови [1].

Основними чинниками, що визначають видовищність кожної композиції, вважають:

- майстерність і професіоналізм;
- постановочні оригінальні рухи;
- костюми;
- музичне оформлення;
- художнє оздоблення.

Кожен з цих елементів тісно пов'язаний з іншими і несе своє навантаження при народженні художнього образу.

Особливості хореографічної підготовки у спортивній аеробіці, а також професіоналізм в роботі тренера-хореографа й тренера вимагають, щоб процес підготовки спортсменів відповідав регламенту змагань, тенденціям розвитку і специфіці спортивної діяльності. Знання особливостей хореографічної підготовки, артистизму в спортивній аеробіці є необхідною умовою підготовки висококваліфікованих спортсменів.

Значення хореографічної підготовки у вдосконаленні виконавчої майстерності спортсменів вже давно визнано у світі. В цілому фахівці визначають хореографічну підготовку як систему, котра виконує технічну, спеціально-фізичну, естетичну, освітню функції, а також відзначають її роль у композиційному вирішенні спортивних вправ [3].

Комплексне використання різноманітних засобів хореографії та елементів спорту буде лише тоді ефективним, коли тренер-хореограф добре знає основи хореографії та артистизму з урахуванням тенденцій розвитку, правил змагань та особливостей даного виду спорту [4].

Хореографічна підготовка, яка із самого початку свого впровадження в спорті слугувала вихованню культури рухів, артистизму спортсмена - сьогодні стала невід'ємним складником навчально-виховного процесу

У спортивній аеробіці авторами спортивно-хореографічної композиції виступають тренер, тренер-хореограф і сам спортсмен. У кожного з них своя роль у процесі створення вправи.

На початку роботи тренер розглядає індивідуальні можливості спортсмена, його вміння створювати художній образ. Потрібно розбурхати фантазію і спрямувати її до необхідного русла логічного осмислення сценічного образу, який відповідає замислу композитора. Знайомство з твором починається з прослуховування та складання «ескізного образу». Роль тренера на даному етапі - дати «ключ» до відкриття змісту музичного твору. Останнім часом на виступах спортсменів все частіше лунає музика сучасних композиторів або народна і класична музика у сучасній обробці, використовується також і мелодії з кінофільмів, пісень, різного роду електронна музика, поп- і рок-музика, джазова і т. п. Зовсім недавно правилами змагань заборонялось використання музики зі співом. Зараз правила змагань лояльніше підходять до цього питання.

Музика - це органічна складова частина композиції, яку спортсмени і тренери виносять на суд глядачів та суддів. Побудова, характер, темперамент спортивної програми закладені в музиці і визначаються нею. Від того, наскільки музика образна і виразна, багато в чому залежить зміст програми. У гармонійному поєднанні музики, постанови, хореографії і якості виконання спортивних елементів криється успіх майбутньої програми [2].

Музичні програми, складені з одного або різних творів, повинні самі по собі мати закінчену форму і слухатися як окремі музичні твори, а не як додатки до спортивних програм. Доцільно використовувати різні музикальні жанри, відповідно до віку та статі спортсменів. Тим часом, регламент спортивної програми вимагає створення нових, музичних форм з яскраво вираженою, колоритною темою.

Особливе значення і актуальність набула проблема вивчення змісту і структури музичної композиції. Легкість і невимушеність, амплітуда рухів, чистота ліній і виразність, індивідуальний стиль виконання відрізняють спортсменів, що мають високу

культуру руху. Саме музичний вибір відіграє значущу роль у складанні композиції, тому на сьогоднішній день тренери - спеціалісти провідних країн, намагаються створити унікальний образ для кожного спортсмена, розкрити індивідуальні особливості, концентруючи увагу на артистичну сторону і з'єднати з музичним супроводом у єдине ціле.

Метод музичної інтерпретації широко використовується при побудові змагальних композицій у спортивній аеробіці. У його реалізації можна виділити два підходи: перший пов'язаний з конструюванням конкретної вправи, а другий - з варіаціями рухів відповідно до змін у змісті музики. В основі першого підходу лежить складання вправи на задану музику з урахуванням змісту, форми, ритму, динамічних відтінків, тобто конструювання вправи з урахуванням основ музичної грамоти. Можна скласти вправу, в якій кожний рух виконується на одну або декілька частків такту, але при цьому треба, щоб початок і закінчення вправи співпадали з музичним тактом або музичною фразою. При визначенні кількості повторень кожної вправи треба, щоб перехід на новий рух був здійснений у відповідності з "музичним квадратом". Сильні і слабкі частки такту можуть супроводжуватися певними рухами (підскоками, стрибками, махами, оригінальними вставками і т. п.).

Реалізація другого підходу власне і є методом музичної інтерпретації. Треба скомпоновати підібрані вправи відповідно до музичної теми. Інтерпретації музичних творів тісно пов'язана із формуванням та розвитком музичних та творчих здібностей спортсменів, їх музичного мислення, уяви, емоційності та натхнення. Тому формування умінь інтерпретувати музичний твір є необхідною складовою підготовки спортсменів зі спортивної аеробіки, яка допоможе оптимізувати тренувальний процес. Філософська категорія "інтерпретація" вживається поруч з такими поняттями як сприйняття, відображення, пояснення і розуміння. Інтерпретацію в спорті можна розглядати як творче спілкування особистості (спортсмена) з автором музичного твору. Спортсмени та тренер демонструють уміння аналізувати, здатність до самостійного і свідомого тлумачення музичних творів різного жанру, стилю та напрямку.

Необхідним є емоційне виконання та створення художнього образу. Завдяки злиттю характеру рухів з характером музичного супроводу, виконання вправи набуває різного емоційного забарвлення, танцювальності, артистизму. Цей зв'язок проявляється не лише у погодженості руху з розміром та темпом музичного супроводу. Він полягає в умінні правильно розуміти музику і виконувати рухи відповідно до її змісту та форми. Музика створює яскравіше уявлення про характер руху, ніж слово і тонше розрізняє його емоційні нюанси.

У процесі занять спортсмени знайомляться з засобами музичної виразності, до яких відносяться мелодія, темп, динамічні відтінки, ритм, розмір, структура музичного твору, характер звучання му-

зики та ін. Сукупністю всіх цих засобів створюються музичні образи, зміст яких відображає задум композитора. Це допомагає глибоко сприймати музику, розвивати художній смак.

При складанні вправи слід стежити за спільністю кордонів (фраз, пропозицій, періодів), їх однаковою тривалістю. Це надає вправі логічність, організованість, тісно пов'язує їх з музикою. Такий зв'язок допомагає спортсменам краще зрозуміти музичний твір і створити образ. Форма, зміст, тривалість музичного супроводу повинна відповідати технічним і артистичним можливостям спортсменів, а також підкорятися вимогам, що традиційно склалися та затвердженим правилами змагань.

Можливі кілька шляхів підбору музичного супроводу.

Перший шлях - опрацювання музичних творів з урахуванням індивідуальності спортсмена.

Другий шлях - використання різних музичних творів без їхнього аранжування.

Третій шлях - найкращий спосіб - є написання спеціальної музики до вправи. Цей спосіб вимагає великого композиторського таланту та високої кваліфікації спортсменів, які займаються спортивною аеробікою, тому він найскладніший.

Мистецтво музики потрібно розглядати у всіх реальних його зв'язках із дійсністю. У музичних образах завжди відображається життя і ці образи несуть у собі "соціальні, національні та історичні риси". Музичні твори різноманітні, їх виразні засоби нескінченно багаті.

Пристаючи до складання вправи, слід, передусім, розібратися у змісті музичного твору, вдуматися у його музичні образи, емоційне забарвлення почуттів, прихованих у ньому.

Потім складається структура вправи, розподіл елементів, пересування майданчиком, які залежать від музичного тексту, його мелодії, ритму, визначаються музичною формою. Необхідно серйозно відбирати засоби виразності танцювальних штрихів та рухів, які мають відповідати характеру музики.

У спортивній аеробіці рухова виразність більш значуща, ніж статична. Даний вид виразності здатний повною мірою відобразити задум композиції та характер музичного супроводу.

Виразні рухи – це прояв емоційних переживань спортсмена за допомогою рухів тіла, жестів, постанів, міміки тощо.

Висновки. Інтерпретація музичних творів є складним багатоаспектним процесом, що містить величезні можливості для вияву і реалізації спортсменами виконавських здібностей та умінь, творчого потенціалу та віддзеркалення набутого художнього досвіду. Інтерпретація музичних творів дозволяє спортсмену глибоко зрозуміти художньо-образний задум та творчо його відтворити у власному виконанні, продемонструвавши артистизм на самому високому рівні.

Закінчена змагальна програма має бути видовишною й виразною, відповідати вимогам узгодженості вправ із характером музики, мати оригінальні спортивні елементи й танцювальну «лексику», підкреслювати артистичність спортсменів, синхронність виконання в групових вправах. Спорт, як і театр, немислимий без публіки-глядача-вболівальника. Саме для глядачів, уболівальників спортсмени намагаються показати «красиву гру», демонструючи не тільки спортивну майстерність, а й артистизм. Артистизм у спорті можна розглядати як одну з можливостей (а, можливо, і єдину) для спортсмена виявити свою індивідуальність: художню, творчу, особистісну, за допомогою правильно підбраного музикального супроводу.

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SPORTS ANIMATION AS A MEANS OF INCLUSION OF CHILDREN WITH SPECIAL EDUCATIONAL NEEDS

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Abstract

In recent decades, in the scientific space, more and more people talk and work in connection with the so-called hypodynamia, which is motor activity insufficient for people's good health. Attempts to counteract this phenomenon are implemented at different levels and in different areas, including and in education. This article examines the opinion and attitude of students preparing to work as special educators, to the benefits for themselves as educators and to the motor activity of the children with whom they will work in the future, as well as to the possibilities in the application of acquired sports-animation competence, as a result of training in the discipline "Sports animation in an educational environment". The respondents of the research are 23 students from the fourth year of the Faculty of Education at Trakia University - Stara Zagora. The method of pedagogical research survey was used. The results show high levels of positivism towards the importance of acquiring sports-animation competence and its application in and outside the professional-pedagogical activity.

Keywords: sports animation, special educational needs, pedagogues

The problem under consideration is related to the presence of widespread hypodynamia in public life in recent decades, including and in children, researched and scientifically proven by specialists in the field. This is provoked by many factors, one of which is the modern technological achievements of mankind. The computer and the modern phone fell into the hands of children and largely replaced their play activities in their free time. Advances in vehicles have made it possible for children to get around in cars and electric scooters, neglecting walking and cycling. Urbanization and the increased number of means of transport have turned free play areas in residential areas into parking lots.

All of this took away much of the movement essential to human life, limiting physical work to a minimum. Hypodynamia means reduced motor activity, insufficient to maintain good health. It is well known that active motor activity is one of the most powerful means of increasing the resistance forces, increasing the physical and mental capacities of the body and thus protecting against diseases. A number of specialists rightly call hypodynamia a "disease of modern civilization", because diseases characteristic of the past mainly for the elderly are now more and more common in adulthood, in youth and even in childhood.

The concern of the State on this serious problem is obvious and this is evident from the increased number of activities and hours related to motor activity in school education. However, the normatively planned weekly volume of movement in preschool and school age does not fully cover the standards accepted and indicated in a number of documents at the world, European and national level. The existence of humanity in the age of technology with a desire for sustainable development and European integration leads to the need to apply new strategies in all spheres of life, including educational and sports-pedagogical ones. In this regard and in the spirit of the competence approach, the factors responsible for increasing the quality of higher pedagogical education are called upon to respond to modern

challenges by forming professional-pedagogical competencies adequate to the needs of society. The qualification of pedagogical personnel is of great importance for the effectiveness of both the learning process and the forms of extracurricular work in physical education (Ivanov, Tomova, 2010).

The article introduces the idea of sports animation and sports-animation pedagogical competence as an opportunities to counteract the existing hypodynamia. Sports animation is a set of sports and sports-entertainment services that purposefully satisfy the needs of consumers. Sports animation uses the means of physical education, but goes beyond the traditional forms of education, breaking the types of sports and motor activities laid down in the curricula. The sports-animation competence of the pedagogue is a professional-pedagogical competence for properly planning, organizing, conducting and leading activities with a sports-animation focus in the children's free time during weekdays and weekends and vacation periods.

In this regard, in 2017, the elective course "Sports animation in an educational environment" was introduced in the pedagogical specialties of Trakia University. Initially, the specified discipline was applied as a priority in the specialties "Preschool and primary school pedagogy", "Primary school pedagogy with a foreign language" and "Social pedagogy". In the academic year 2022/23, for the first time, training was also held for students from the "Special pedagogy" specialty, in which future pedagogues are prepared to work with children and students with "special educational needs and in particular those with communication difficulties; work on overcoming communication disorders and applying alternative approaches for community integration" (<http://uni-sz.bg/truni4/обучение/бакалавър/#SpP>).

The purpose of this research is to study the attitudes of students from the "Special pedagogy" major regarding their opinion on the benefits of training and

the purpose of its implementation – acquisition of professional-pedagogical competence for the implementation of sports-animation activity, as well as their significance regarding the applicability of the acquired competence in and beyond the future their pedagogical practice.

Methodology

At the end of the training conducted with 23 students from the fourth year - specialty "Special pedagogy - resource teacher" in the specified discipline, a standardized written survey was conducted with four research questions: the respondents' opinion on the possibilities of applying acquired competence in practice; their attitudes towards the benefits of learning by increasing the knowledge and skills of sports culture through the topics included in the curriculum and their opinion about the usefulness of sports animation when working with children with special educational needs.

The questions asked are:

1. "Indicate your opinion regarding the possibilities for applications of the sports-animation pedagogical competence in the professional activity of a special pedagogue!";

2. "Indicate your opinion regarding the possibilities for applications of sports-animation pedagogical competence outside the professional activity of special educators!";

3. "What are your attitudes towards the benefits of studying the subject?";

4. "Do you think that the application of sports animation as a tool will contribute to increasing the motor activity of children with special educational needs?".

The rating scale used is 5-level, as follows: 1 – categorically negative/s; 2 – rather negative/s; 3 – I have no opinion; 4 – rather positive/s; 5 – categorically positive/s.

Results and Analysis

The results obtained from the study are presented in fig. 1.

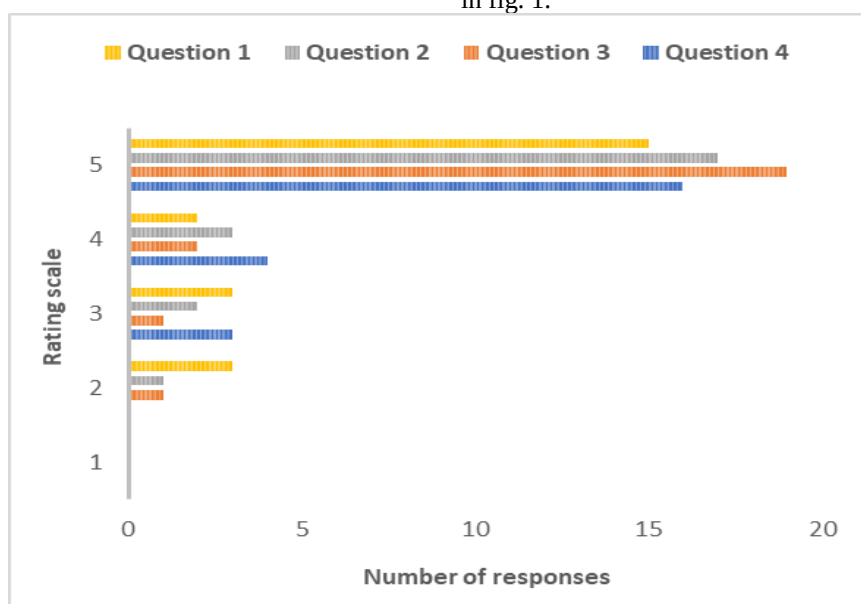


Figure 1. Results of the answers to the questions

The obtained and analyzed results clearly show high levels of positivity towards the benefits of training and the application of sports animation as a means of increasing the motor activity of children with special educational needs. The students as respondents also express their positive attitude towards the possibilities of applying the acquired sports and animation competence in and outside the professional work of special educators.

Conclusion

The educational environment plays a key role in stimulating both gaming and any other activity related to movement (Tileva, 2022). The fact that motor activity itself provokes active involvement speaks for itself. Presented in an interesting and suitable way for those involved, the sports-animation activity provokes a desire to participate. In addition to improving the condition of the motor apparatus, the movement affects the thinking abilities and builds a personal attitude towards all other participants.

The categorically expressed opinion that the applicability of the acquired sports-animation competence of the special pedagogues has high possibilities, both outside and in their future professional activity and will lead to an increase in the levels of children's motor activity, speaks of the benefit of the conducted training. Which, in turn, turns sports animation into a tool for working with children with special educational needs.

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COGNITIVE PROCESSES AND INSTRUCTIONAL STRATEGIES IN ENGLISH LANGUAGE TEACHING

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Abstract

This paper investigates the implementation of diverse pedagogical strategies in English language learning, emphasizing the necessity for methods that integrate cognitive and communicative development. It critiques traditional, text-centric approaches and proposes the adoption of consciousness-raising activities that draw students' attention to linguistic features. Narrative techniques are explored as tools for vocabulary enhancement, while co-operative learning principles are considered for their potential to foster collaborative skills. The study also incorporates an evaluation of innovative methods that challenge the conventional paradigms of language teaching. Overall, the research advocates for a comprehensive approach that combines traditional instructional tools with practical language usage tasks, aiming to equip learners with the skills needed for effective communication in an interconnected world.

Keywords: Consciousness-Raising, Vocabulary Enhancement, Cooperative Learning, Innovative Teaching, Communicative Competence

Introduction:

The pursuit of English language mastery in an era marked by rapid globalization is no longer a luxury but a necessity. Traditional pedagogical models that depend heavily on text-based exercises, listening tasks, and grammatical drills are proving to be less effective in a world that values immediacy and practical communication skills. These methods, still entrenched in many school and university curricula, consume substantial time and often lead to unsatisfactory levels of engagement and poor learning outcomes. The fundamental flaw lies in the absence of direct interaction with the language, which is paramount for authentic and engaging learning experiences.

This paper challenges the status quo of English language teaching by scrutinizing the efficacy of traditional educational resources and advocating for a paradigm shift towards methods that prioritize direct language engagement. It underscores the need to transition from a teacher-centric, theory-heavy approach to one that is learner-centric, where language is not just taught but actively experienced and used.

In light of these considerations, this paper seeks answers to the following pressing research questions:

1. How do direct methods of language instruction compare to traditional textbook-based approaches in terms of fostering active language engagement and learner motivation?
2. What are the implications of integrating direct language use in the classroom for the overall effectiveness of English language acquisition?

By addressing these questions, the paper aims to re-envision language education and promote teaching strategies that are better suited to the demands of contemporary learners, ensuring that the journey towards English proficiency is both efficient and rewarding.

Methods:

This study adopts a comparative pedagogical analysis to evaluate the efficacy of traditional and direct methods of English language instruction. It seeks to

discern the extent to which each approach facilitates not only the acquisition of theoretical knowledge but also the development of practical language skills that learners can apply in real-world contexts.

In alignment with Alisoy's (2023) work on motivational types in second language learning, the investigation involves a close examination of the motivational impacts of different instructional materials and methods on learner success. The study draws upon a range of classroom resources, including audio and visual aids, interactive activities, and participatory learning strategies that are purported to enhance both theoretical understanding and practical usage of English.

Following the insights from Asadova (2023) regarding phonetic fluidity, the study pays particular attention to pronunciation exercises, integrating techniques aimed at achieving native-like articulation. These techniques are evaluated for their ability to improve phonetic competence among learners of varying proficiency levels.

Hasan's (2023) exploration of innovative teaching approaches provides a framework for this study's methodological choices, particularly in the context of novice language learners in higher education. The study includes the implementation of breakthrough strategies suggested by Hasan, which are intended to transcend the limitations of traditional pedagogy.

Finally, the study considers Babayev's (2022) findings on the correlation of language skills developed through traditional methods. It assesses the interconnectedness of reading, writing, speaking, and listening skills as developed through conventional language instruction compared to direct methods that encourage immediate language use.

Data will be collected through a combination of classroom observations, learner surveys, and performance assessments. Observations will focus on classroom dynamics, the interaction between instructors and students, and the responsiveness of students to different teaching materials and activities. Surveys will gather

learners' perspectives on their motivational levels and perceived effectiveness of each instructional approach. Performance assessments will provide tangible evidence of skill development, allowing for a comparative analysis of the learning outcomes associated with each method.

The study will be conducted at Azerbaijan State Pedagogical University, with the participation of English language learners enrolled in various programs. By examining these methodologies in a live educational setting, the study aims to generate findings that are immediately applicable and beneficial to educators, including esteemed colleagues like Shehla Salmanova, and, more broadly, to the field of language pedagogy.

Results:

The comprehensive investigation into the array of English language teaching methodologies has produced profound insights, significantly emphasizing the symbiotic relationship between traditional and modern pedagogical approaches. The study, informed by the pedagogical theories advanced by Turg'unova and Rustamova (2023), indicates that interactive teaching methods markedly enhance student engagement and elevate the overall educational experience. This enhancement is attributed to the incorporation of dynamic, student-centered learning activities such as collaborative projects, peer-to-peer exchanges, and the strategic use of multimedia resources. These interactive modalities engender a classroom environment that is not only educationally stimulating but also conducive to maintaining high levels of student interest and motivation.

Furthering the discourse on methodological diversity, the research substantiates the assertion by Turg'unova and Rustamova (2023) that blending time-honored teaching techniques with cutting-edge pedagogical innovations yields a richer, more immersive language learning experience. Traditional methods, revered for their proven effectiveness in instilling grammatical rigor and foundational vocabulary, when dovetailed with innovative practices, empower learners to explore and master the English language in ways that are both practical and inventive. This harmonious blend facilitates a learning trajectory that is as disciplined as it is adaptable, allowing students to navigate the intricacies of the language with enhanced proficiency and confidence.

A particularly striking outcome was observed with the application of the eclectic method in the domain of phonetics and phonology teaching. This methodological approach, characterized by its versatility and capacity to assimilate various instructional styles, has demonstrated a significant positive impact on learners' ability to accurately articulate and comprehend the nuanced sound systems intrinsic to the English language. Through the eclectic method, learners were actively involved in transformative research activities that provided them with the opportunity to delve into and scrutinize the intricacies of English phonetics and phonology. Such deep engagement has led to a refined mastery over the phonetic and phonological components of the language, thereby enhancing both their receptive and productive language skills.

In practical terms, the study revealed that learners exposed to an eclectic amalgamation of teaching methodologies exhibited superior English language proficiency. This advancement was not limited to theoretical knowledge; it also encompassed the practical application of English across diverse communicative scenarios, ranging from simulated business negotiations to academic debates and creative role-playing exercises. The empirical evidence gathered through formal assessments, as well as observational data on communicative performance, underscores the efficacy of integrating a broad spectrum of instructional strategies. This inclusive pedagogical practice fosters a comprehensive language education ecosystem, wherein students are equipped with a robust foundation of linguistic theory complemented by the practical acumen necessary for effective language utilization.

The study's results underscore the indispensable nature of a holistic approach to English language instruction. By weaving together a diverse array of pedagogical practices, educators are positioned to cultivate an inclusive and expansive learning milieu that is responsive to the complex demands of language acquisition. This pedagogical philosophy not only preserves the revered tenets of traditional language teaching but also actively incorporates the progressive elements of modern educational methodologies. Consequently, this integrative approach prepares students to confront and surmount the linguistic challenges presented by a rapidly evolving global landscape, endowing them with the linguistic dexterity and cultural fluency essential for success in the contemporary world.

Discussion:

The findings of this study present crucial insights for language instruction, with a focus on the pedagogical environment at Azerbaijan State Pedagogical University. Reflecting on Wilga Rivers' seminal work, "Teaching Foreign Language Skills," it is evident that the effectiveness of language teaching is deeply rooted in the adaptability and diversity of instructional styles and materials. This adaptability is not merely a preference but a necessity to meet the varied linguistic needs and learning trajectories of students.

A major challenge identified in traditional language teaching methods is the effective teaching of pronunciation. This study reinforces the significance of interactive teaching methods, as highlighted by Turg'unova and Rustamova (2023), in addressing this challenge. These methods, which emphasize active engagement with phonetic and phonological aspects of English, provide learners with a more integrated and comprehensive learning experience, thereby improving their pronunciation and overall language understanding.

Additionally, this research supports the use of the eclectic method in teaching phonetics and phonology, as exemplified by the work of Alisoy (2023). The eclectic approach, which combines various instructional techniques, offers a customized learning experience that caters to the unique phonetic needs of each student, thereby enhancing their linguistic proficiency.

The results also point to the importance of placing traditional instructional materials, like tables, within a

broader communicative context. This aligns with the successful integration of both traditional and contemporary teaching methodologies as discussed by Turg'unova and Rustamova (2023). By embedding these tools in real-life communication scenarios, students are better equipped to grasp the practical application of language concepts, significantly improving their command of English.

This discussion underscores the need for instructional strategies that transcend traditional approaches. Such strategies should not only convey theoretical knowledge but also enable students to confidently apply English in real-world interactions. Moving towards a communicative model is crucial for developing effective conversational skills and ensuring that students can adeptly handle the complex facets of English.

In summary, the findings advocate for a balanced and dynamic approach to language instruction at Azerbaijan State Pedagogical University. This approach should merge the solid foundation provided by traditional methods with the engaging and practical aspects of modern communicative techniques. Implementing such a comprehensive approach will create an educational environment that not only fosters language proficiency but also equips students to meet the linguistic demands of a globally connected world.

Conclusion:

The journey to achieve proficiency in English transcends the confines of conventional classroom learning, encompassing a broader spectrum of cognitive and communicative skills. This study strongly advocates for the integration of traditional instructional tools, such as tables, within a dynamic and interactive framework that addresses both the cognitive processes and communicative needs of language learners.

The findings of this research emphasize the importance of a holistic approach to English language education, one that blends the theoretical underpinnings of language with practical, real-world applications. By engaging students in a variety of communicative tasks, educators can facilitate a more comprehensive and meaningful acquisition of language skills. This approach not only reinforces the theoretical aspects of language learning but also empowers students to apply their knowledge in diverse and authentic contexts.

In conclusion, the path to linguistic proficiency in English requires a multifaceted educational strategy, one that harmoniously combines traditional methodologies with innovative, communicative practices. Such a strategy should be geared towards developing not just the ability to understand and use English but also to think and express oneself fluently and confidently in the language. The implementation of this balanced approach at institutions like Azerbaijan State Pedagogical University will significantly enhance the overall effectiveness of language teaching, preparing students to navigate the complexities of English in a globally interconnected world.

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AN INDIVIDUAL APPROACH TO LEARNING DICTATED BY THE TIMES

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Abstract

The article by Polumeeva I.N. considers the issue of the relevance of an individual approach, the benefits of feedback for the teacher, indicates the need for feedback to understand the perception and expectations of the audience and draws attention to understanding of the individual approach by students.

Аннотация

В статье Полумеевой И.Н. рассмотрен вопрос актуальности индивидуального подхода, пользы для преподавателя обратной связи, указана необходимость проведения обратной связи для понимания восприятия и ожиданий аудитории слушателей и обращается внимание на понимание обучаемыми индивидуального подхода.

Keywords: individual approach, individual characteristics, feedback, personification of learning, personal contact.

Ключевые слова: индивидуальный подход, индивидуальные особенности, обратная связь, персонификация обучения, личный контакт.

Modern conditions of society's development pose many tasks to specialists of different professions, the solution of which requires knowledge and skills in using computer programs, innovative methods and technologies, readiness and ability to learn, and the desire to keep up with the times. The teaching profession is no exception, school teachers, teachers of higher educational institutions, responding to the challenges of modernity, work with students both offline and online, practice mixed learning. Teachers not only organize and conduct educational and methodological work and carry out curricula, in accordance with the educational programs but also participate in research activities. These are not all the responsibilities of a modern teacher. Many specialists can be involved in the organization of the learning process, but their work is aimed at its main participants, the teacher and the student. Learning is a two-way process carried out by the teacher and the student. The pedagogical dictionary defines learning as an organized, controlled process of interaction between teachers and students aimed at acquiring knowledge, skills and abilities, forming a worldview, developing the mental and potential capabilities of students, developing and consolidating self-education skills in accordance with the defined goals. [1, 61]

The assimilation of knowledge and the development of opportunities, as well as self-education skills, are not the same for all students, the learning process takes place at different rates depending on the individual capabilities of students, their previous educational experience, preferences in learning technologies, psychological characteristics and this requires an individual approach to learning. In pedagogical theory, an individual approach is considered as one of the most important principles of learning. An individual approach is an important psychological and pedagogical principle. Pedagogical impact is always mediated by the psy-

chological characteristics of the person who it is directed to and the effectiveness of the impact is determined by how this impact is perceived by a person. [2, 177] The individual psychological characteristics of the student should be taken into account when choosing teaching methods and techniques, teaching methods should vary taking into account the individual characteristics of the student, try to find the optimal combination of frontal, group and individual forms of training. [3]

The technical capabilities that the teacher uses today make it possible to get feedback from students in a few minutes. Thus, the educational portal of our university allows you to upload questions for conducting a survey to the platform in the appropriate course of students and see the opinion or achievements of a group of students. If you need to personally contact or give an individual assignment to the listener, you can send a message or assignment personally to the student. Such a personalized approach allows the teacher to maintain contact with the student, answer questions about the content and organization of the course, especially for first-year students. And the listeners, in turn, see in the individually oriented approach the attention and support of the teacher, the opportunity to ask questions not in front of the entire audience, but individually and in writing. The personality-oriented learning process allows you to constantly monitor current changes in students, the formation of competencies and personal development, which is based on the desire for self-actualization and self-development. [4, 127]

The first- and second-year students were asked to take a survey on the topic of individual assignments. Being asked if individual tasks are needed, when you do not understand the topic, 46% answered in the affirmative, 35% - in the negative and 19% chose the option - I find it difficult to answer. Figure 1 shows the percentage of all responses.

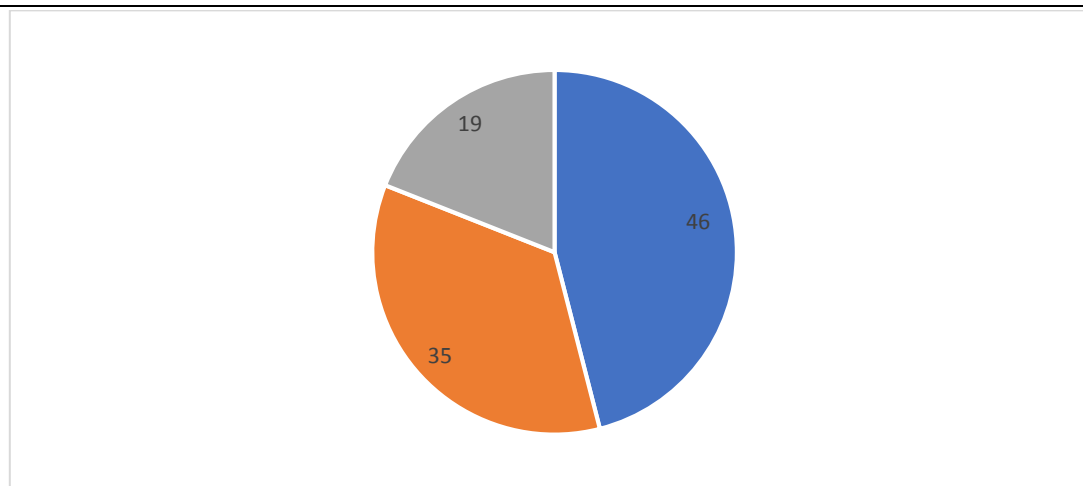


Figure1 Individual tasks

To the question of what individual tasks are needed for, the answer was repeated in different versions – to understand a complex topic, as well as to consolidate new material, find out the weaknesses of the student, increase knowledge, to popularize the subject, to solve particular problems, to gain additional points, in order for the student to find out what topics need to

be addressed pay attention and work through them. In Figure 2, you can see the percentage of the choice of the form of completing the task, 47% chose electronically, 35% in writing and 18% orally. The main part preferred to work in electronic form, which was expected.

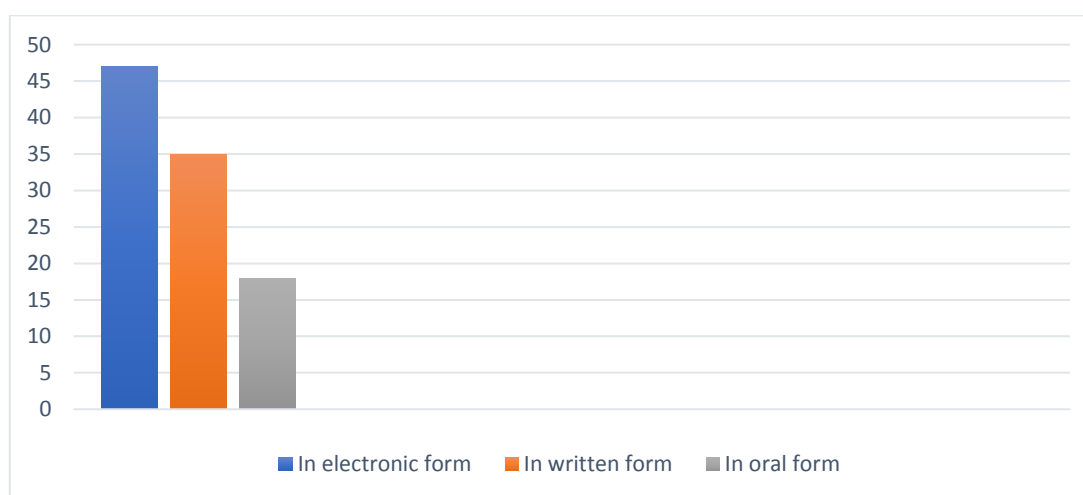


Figure 2 The form of individual tasks.

Questions were also asked about the consultancy. When asked whether teachers should have consultation hours, 61% of respondents believe that they should, 23% answered negatively and 16% found it difficult to answer. Moreover, many of those who answered negatively gave a detailed answer, where they noted that the workload of teachers does not allow, in their opinion, to conduct full-fledged consultancy. What consultancy is needed for, 85% believe in order to ask questions on the topic, 15% in order to get additional tasks.

Conclusion

At this stage of education development, the issues of an individual approach to teaching and individualization of learning are perceived by teachers and students as a fact, as an actual reality. The tasks assigned to a modern teacher include not only conducting classes and evaluating students, developing programs and directing the scientific activities of students, but also teaching analysis, critical thinking, self-organization and self-development.

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COMPARATIVE CHARACTERISTICS OF THE CONTENT AND STRUCTURE OF SCHOOL GEOGRAPHY EDUCATION IN POLAND AND UKRAINE

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Abstract

In the article, the authors performed a comparative analysis of the geography school curriculum in Poland and Ukraine. The authors found that in many parts these programs are similar. However, when studying the geography of Poland, greater emphasis is placed on the country's ties with EU countries, while when studying the nature and economy of Ukraine, greater emphasis is placed on Ukraine's place in the global space.

Keywords: geography, school, student, school education

According to Article 53 of the Constitution of Ukraine, every person has the right to receive an education. General secondary education is mandatory. The state guarantees the availability and free of charge of preschool and full general secondary education, as well as provides state scholarships and benefits for pupils and students. According to this provision, Ukrainian school education is compulsory and free. Complete secondary education in Ukraine lasts 12 years and consists of the following stages:

- Primary education (grades 1-4)
- Basic general secondary education (grades 5-9)
- Complete general secondary education (grades 10-12)

The first stage of education is primary education, which children can receive from the age of six or seven. In comprehensive schools, students receive primary and basic secondary education. After the 9th grade, students can choose to complete secondary education at school (grades 10-12) or to study at vocational colleges or schools for 4 years, which allows them to obtain a certificate of complete secondary education and certain professional qualifications. Young people finish the third (last) stage of general secondary education at the age of 18, when they become adults. After completing secondary school studies, students take the external examination, which allows them to enter higher educational institutions of Ukraine.

Compulsory education in Poland lasts 12 years. It can be divided into the following stages:

- Primary education (grades 1-8) - szkoła podstawowa
- elementary school (grades 1-3)
- 1st grade secondary school (grades 4-8)
- Second level secondary education - szkoła ponadpodstawowa - at the student's choice:

➤ General Lyceum (LO): an educational institution where each class is distinguished by its specialization, and studies last four years.

➤ Plastic Lyceum (art school): intended for children who are interested in general education and at the same time seek to acquire professional artistic skills. Education lasts five years.

➤ Technical College (T): an educational institution that provides a five-year secondary education along with professional skills.

➤ Branch school I level (SB I): the institution provides an opportunity to obtain qualifications in the chosen profession and studies here last for three years. After it, you can go to a branch school of level II (SB II), where you can supplement your professional education for two years.

During the primary school education period, there are two stages: primary school and upper secondary school, which last a total of 8 years.

In primary school (grades 1-3), teaching is conducted by the class teacher, except for certain subjects, such as music, physical education, foreign language and others. From the 4th to the 8th grade, children are taught by individual teachers in different directions.

Only in grades 6-8, children study individual subjects. During this period, there is a separate teacher for each subject. Children study Polish and foreign languages, mathematics, natural science, chemistry, physics, biology, history, music, art, physical education, informatics, work training, religion or ethics, and education for family life (consent for the child's participation in these subjects is accepted parents).

There is no such subject as "Geography" in elementary school in Ukraine, but students gain knowledge in this direction during the integrated course

"I explore the world" (grades 1-4). This subject is allocated in grades 1-4 for 3 hours per week in each class, where only 1 hour is allocated for the science component. In accordance with the Model Program, approved by the Order of the Ministry of Education and Science of Ukraine dated 12.08.2022 No. 743-22, in the course "I explore the world" the content lines "Man and nature" (knowledge of nature; the relationship of objects and natural phenomena; man-made world; responsible human activity in nature; the role of natural knowledge and technologies in human life; dependence between human activity and the state of the environment, human-nature relationships; human use of natural knowledge, materials, products and technologies; responsible activity of man in nature; rules of behavior in nature; children's participation in nature conservation activities), "Nature" (diversity of nature; methods of studying nature; inanimate and living nature; connections in nature; nature of the Earth; nature of Ukraine). These and other content lines of this integrated course are defined by the State Standard of Primary Education [5].

According to the Program, in the 1st grade, students study what belongs to nature, objects of living and non-living nature, learn to understand the need to preserve nature and its components. In the 2nd grade, students form an idea about the shape of the Earth; study the influence of the Sun on seasonal phenomena in nature; causes of changes in the seasons, observe daily and seasonal changes in nature; study the types of reservoirs, reservoirs of the native region; the main forms of the earth's surface; rocks; soil, its properties and significance, etc.

In the 3rd grade, students study the place of Ukraine on the world map; the country's place among European states; get acquainted with the diversity of peoples of the world; study the features, methods and tools of nature research; relationships between man and nature, the impact of human activity on nature, professions related to the study of nature.

In the 4th grade, students study the nearest neighboring countries of Ukraine, make virtual trips to other countries, study the cooperation of people in matters of preserving nature and life, the contribution of each person to the preservation of different cultures and natural resources. Deepen knowledge about the universe, the solar system, celestial bodies; consequences of rotation and movement of the Earth; learn about the natural zones of the Earth. In the 4th grade, students first get acquainted with the ways of depicting the Earth on geographic maps, globes, and terrain plans. They also study the peculiarities of the placement and formation of the nature of the Earth's continents and oceans. It is important in the 4th grade to turn the educational program to the study of the peculiarities of the geography of Ukraine, in particular when considering the questions: Nature of Ukraine. Ukraine on the world map. The most important natural objects of Ukraine and their area. Natural resources of Ukraine, their diversity and importance. Natural zones of Ukraine. Characteristics of the natural zone: natural conditions, flora and fauna, peculiarities of people's work and life. The impact of

human activity on nature. Seasonal changes in the nature of Ukraine. Natural groups. Folk traditions that reflect the attitude of Ukrainians to nature. Nature protection in Ukraine.

The purpose of science education for the primary grades of general high school is to promote the development of scientific thinking and the culture of research, the formation of systemic ideas about the integrity and diversity of nature, the establishment of principles of sustainable development, and the teaching of effective, safe and ecologically oriented behavior in the environment.

According to the above-mentioned goal, the key tasks of science education for primary school are:

- Cultivating a sense of respect and love for the nature of the native region, Ukraine and the Earth.
- Formation of ecological and ethical behavior in nature, stimulation of participation in nature conservation measures.
- Development of interest in the study of nature, mastering the methods of educational and cognitive activity and basic skills of scientific research through experiments and observations.

- Gradual formation of ideas about the natural and scientific picture of the world through the deepening of knowledge about natural objects and phenomena, their interrelationships in the system "inanimate nature - living nature", as well as awareness of human influence on the environment and its dependence on it.

In accordance with the goals and objectives of science education in elementary school, the following main directions are distinguished:

- "Nature" - aimed at developing students' research skills by supporting their curiosity and inquisitiveness towards observations, experiments and modeling to find answers to questions about the world around them.
- "Man and nature" - involves the development of younger schoolchildren's ideas about the objects and phenomena of nature, the establishment of connections between inanimate and living nature, the formation of a careful attitude towards nature and the skills of ecological behavior.

- "Man and the world" - aimed at forming general ideas about the world created by man, understanding the relationship between man and nature, which serves as a source for improving children's ideas and projects.

Research (observations, experiments), excursions, as well as students' activities in the field of nature protection and project work play a key role in natural science education.

In Poland, as well as in Ukraine, there is no separate subject "Geography" in primary grades; instead, students study the subject "Nature". The content of the training programs at this stage is similar, although the Ukrainian program is described in more detail than the Polish one. The difference is the absence in the Polish program of a specific list of topics and the number of hours allocated to them, as is done in the Ukrainian program.

According to the Concept of the "New Ukrainian School" and the State Standard of Basic Secondary Education, science education in Ukraine aims to develop students' natural and scientific competence, which is

the basis of the general culture of the individual and contributes to the development of their creative potential. This competence is based on a complex of approaches to the educational process, including competence, activity, integrative, person-oriented, research, problem-situational, differentiated and reflective approaches.

According to the State Standard of Basic Secondary Education, which will be implemented gradually from September 1, 2022, in the 2023/2024 academic year this standard will be applied to students of the 5th and 6th grades. Students of grades 7-11 will continue their studies according to the standard of basic and comprehensive general education of 2011.

According to these documents, as well as the Model Educational Program for grades 5-9, the educational process in the 5th-6th grades in the field of science education can be organized in the following ways:

1) according to model educational programs "Getting to know nature" for grades 5-6 with mandatory study of "Geography";

2) according to the model curriculum "Environment" for grades 5-6 with compulsory study of "Geography";

3) according to the model curriculum "Natural Sciences" for grades 5-6; the separate subject "Geography" is not studied, since the content of the geographical component is included in the "Natural Sciences" program.

In the 7th grade, during the "Continents and Oceans" course, students get acquainted with the nature of the continents, their physical and geographical features.

The study of geography in the 8th grade ("Ukraine in the world: nature, population") is aimed at creating a deep understanding of Ukraine as a component of the world community of states through comprehensive study. This course contributes to the formation of the student's sense of self-esteem as a citizen of Ukraine, fosters respect for the Ukrainian people, their culture, and stimulates a sense of patriotism. The course program provides 70 hours (2 hours per week), of which 3 hours are allocated for additional tasks.

The main principle of this course is integration, which combines physical and socio-geographic components in the study of natural complexes and the population of Ukraine and its regions, taking into account the knowledge gained during the study of world geography in the 6th and 7th grades. Special attention is paid to the study of the population of Ukraine on the basis of topics that have already been studied about the population of the world in previous courses, as well as at the expense of deepening this knowledge.

Geography in the 9th grade ("Ukraine and the world economy") completes basic geographic education at the basic level. This course is allocated 52 hours (1.5 hours per week), of which 3 hours are reserve time. The main goal of the course is to understand the trends in the development of the national and world economy, to determine the place of Ukraine in the modern world. Its content is built on the principle of integration, combining socio-geographic components while studying

the peculiarities of the development and structure of the economy in the world, Ukraine and its regions.

The program includes seven practical assignments, four of which are mandatory for assessment. They are aimed at developing skills for working with geographical maps and other sources of information, which helps in the further development of cognitive and professional skills. Also, students have to carry out research of their own choice, the results of which will be presented and evaluated by the teacher.

In the 10th grade, students get acquainted with the countries and regions of the modern world, the modern political map of the world, classifications of countries according to various characteristics, the structure and placement of branches of the world economy [6].

In the 11th grade, during the study of the course "Geographical space of the Earth", in essence, there is a repetition of the geographical knowledge of schoolchildren, which they acquired during the study of geography in grades 6-10 [6].

If we compare the contents of the geography program in the middle classes of Ukraine and Poland, it is worth saying that significant similarities can be traced in the 7th grade in Ukraine and in the 8th grade in Poland, when the entire academic year is devoted to the study of the continents and oceans of the world. Certain similarities can be traced in terms of the content of studying the geography of one's country. Both in the Polish and in the Ukrainian school curriculum, the study of the geography of one's country is integrated into the study of the geography of the world. However, in the Polish program, more emphasis is placed on placing Poland in the space of the EU countries and relations with them.

Then, as the study of Ukraine takes place in the global context. The geography of Poland is studied in the 7th grade, and in Ukraine, the geography of one's country is studied in the 8th and 9th grades. However, it is worth noting that in the 10th grade, during the study of individual countries of the European space (for example, Great Britain, Poland, etc.), a special emphasis is placed on the relations of these countries with Ukraine.

A similar feature of the geography programs of both countries is the study of their "Little Motherland". In the Polish program - in the 7th grade, and in the Ukrainian - in the 8th grade (Chapter V. Nature and population of its administrative region).

A comparison of the total number of hours allocated to the study of geography at school gives us the opportunity to state that, in general, this subject is taught in Ukraine by 170 hours more than in Poland. At the elementary school level, both countries have implemented an integrated course that combines knowledge from several disciplines, including and geography. However, the number of hours per year in Ukraine is 11 hours more in grades 1-4 than in Poland. In secondary classes, we see that the number of hours allocated to the study of geography in Ukraine is 2-2.5 times greater in individual classes than in Poland.

In senior classes in Ukraine (grades 10-11), 87 hours are allocated to geography, while in lyceums in Poland - 104 hours. What is similar is that high school

in both countries places a significant emphasis on studying global human problems and deepening knowledge of the geography sections that students studied in high school. However, in Poland, a whole year is devoted to a detailed study of the geography of their country - from the diversity of natural landscapes to the economy, cultural features, ethnography and environmental problems.

Conclusions. A comparison of the school geography curriculum in Poland and Ukraine shows significant similarities in the content and structure of both programs. A comparison of the total number of hours allocated to the study of geography at school gives us the opportunity to state that, in general, 162 more hours are taught in Ukraine than in Poland. At the primary school level, both countries have implemented an integrated course that combines knowledge from several disciplines, including geography. An important advantage of the Polish school curriculum in geography is its saturation with practical tasks and the inclusion of the geography of one's Little Motherland in the subject of study. The study of the geography of Poland takes place in conjunction with the study of the geography of the European region.

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USING CULTURALLY SIGNIFICANT PRECEDENT NAMES IN NEWSPAPER HEADLINES

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ГАЗЕТ ТАҚЫРЫПАТТАРЫНДАҒЫ МӘДЕНИ МӘНДІ ПРЕЦЕДЕНТТІ ЕСІМДЕРДІҢ ҚОЛДАНЫСЫ

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Introduction. Title of headline is the name that is given depending on the content of the information from the text. At the same time, it should attract the reader's attention and lead them to read the text. Even the idea, which expressed in the text is in the core of the title. It is possible to predict the thought that will be expressed in the text, to form a point of view through the title. Certainly, it should do with the skill of subject. Finally, we should not magnify if we say that there is a responsibility to arouse public consciousness in the title.

The author can express his point of view through a headline in the newspaper genre, if it is explicitly or implicitly. For example, "The operational investigation team tried to arrest Mr. Zhomart Yertayev" (AT. 01.07.2015), as well as "run away, the banker ran away" (ZhA. 02.07.2018). These articles raise one topic. The former chairman of "Alliance Bank" Zh.Ertayev, who was accused of pocketing a non-refundable loan and causing losses to the bank's funds, said that he escaped from the operational and investigative team. However, even from the name of the two titles and more can be seen.

The first topic is neutral, that conveys information about this situation and has occurred, while the second topic is made on sarcasm. Using speech, sarcasm, characteristic of children, it conveys their irresponsibility (K.Yergaliev, E.Asanbayeva, 2015). At the same time, the foreign scientist W. Rivers of "The Mass Media: Reporting, Writing, Editing" emphasizes the following tasks of the newspaper headline:

- 1) to attract the reader's attention;
- 2) to deliver the basic essence and content of the text;
- 3) to give a symbolic name
- 4) to make the newspaper more attractive (Rivers W., 1990).

The activities of newspaper headlines can be divided into elementary and secondary. The main function of a newspaper headline is, first of all, to provide small and urgent information about a newspaper headline (this is the information, content service of the headline (K.Yergaliev, K.Tekganov, E.Asanbayeva, 2014). Scientist V. I. Konkov "The title of the work should convey its content-idea to a certain extent. If the newspaper headline does not meet its task, there is a probability that the newspaper material will not find its reader and affect the reader (Konkov V., 1995). Also it shows, how much the headline of the newspaper makes sense in drawing the reader's attention to the text.

There is a huge load of the topic, which serves to attract the attention of the reader and influence. At that time, precedent names also have a special function in the creation of an impressive and the relevant topic that adds meaning to the text and serves as a basis for thought. The history of the use of pretentious names in the Kazakh word culture begins far beyond. Even before the appearance of the Kazakh press, examples of literary language is the art of oral speeches, that were examples of speech with precedent names in samples of eloquence. This is a culture and tradition of Kazakh speech, which aims to pass the good that loves and humiliate the bad. The use of precedent names in the press dates back to the XIX century, when the first Kazakh Press began to appear. The structure of precedent names used according to the requirements of life in different eras, the approach of the times is different. We will focus on the use of precedent names in the article on the pages of post-independence newspapers.

The concept of a precedent name began to be used widely in Kazakh linguistics after independence. Especially, a very good idea is given about the use of precedent names on the pages of the press in the works of the

scientist N. Ualiyev. The purpose of the use of such precedent names in the language of the scientist press is to provide a special way of influence the consciousness of the country, usual to the memorized word. Such words include legendary stories, proverbs and sayings. For example, “the word in the basket of Kozhanasyr”, “stories in the turban of Tazsha Bala” are the most used precedent word models on the Kazakh radio (Uali N., 2007).

The term precedent (in Latin – praecedent) is a concept that refers to a situation in which truth is a model or allusion to situations that have already occurred in life, as well as later ones. One of the important tasks of the author is to address of the newspaper text to the reader, such as addressee is to evoke emotions, influence public consciousness. It is called a pragmatic position in scientific language. The activity of the addressee to influence the reader’s consciousness is divided by scientists:

- 1) informational;
- 2) phatic (attracting the reader’s attention),
- 3) manipulative position (forming a point of view).

A precedent situation is a situation that has taken place in the history of a particular society and has an instructive example for generations. A precedent text is the result of completed thinking, speech activity. Such a text includes word samples of a legendary story, poem, literary work, etc.

The use of precedent names in newspaper headlines enhances its figurative nature. It increases the likelihood of acceptance. Such names find to use associated with certain precedent texts. For example, how to touch is the description of the novel “Oh, the world of genius” by the poet and writer M. Shair through the title “How impressive is the description of “Today’s Don Kikhote?” (EK. 28.11.2006). As well as, the title “The True Hercules of the Kazakh spirit” is an impressive reflection in the book of Academician M. Zholdasbekov (ZhA. 01.03.2001) (K.Yessenova, 2007).

The concept of “precedent” in the last years of the XX century by Russian linguistics is considered in the works of Yu.N.Karaulov, Yu. A.Sorokin, while the phrase “precedent name” began to rise in the studies of such Russian scientists like V.V. Krasnykh, D.B. Gudkov, O.A. Vorozhtsova, E.L. Berezovich, G.G. Sergeeva, O.S. Boyarskikh. And the introduction of this concept into Kazakh linguistics also coincides with this period. More precisely, the term precedent in Russian linguistics was introduced into Russian linguistics by the Russian scientist Yu.N.Karaulov in 1986 (Karaulov Yu., 1987).

It is worth to note the names of such scientists as T. Zhanuzak, T. Konyrov, E. Kerimbayev, who were the first to comment on this issue, although they did not use the term precedent in Kazakh linguistics. For example. T. Zhanuzak puts forward a historical and cognitive problem that corresponds to the theory of one name or one concept. Shygybay is a symbol measure of a stingy person, Asan is a very sad soul, Kodar is a merciless, cruel, Kose is a symbol dishonest in the Kazakh sense, (Imanberdieva S., 2015).

The scientist N. Tairova considers precedent names as a special object of study in the work, which functioned of precedent texts in Russian and Kazakh newspapers (Tairova N., 2015). Scientists, who studied specifically the pragmatic activities of newspaper headlines of K. Yergaliyev., E. Asanbaeva’s in the work’s of pragmatic activities of newspaper headlines emphasize the specifics and importance of using precedent names for headlines (Yergalieva K., Asanbaeva E., 2015).

To conclude, it is not without pragmatics of influence in the population for the purpose of using precedent names in the language of the press. In particular, precedent names are particular importance to increase the influence of the Press in the consciousness of the population.

Materials and methods. The use of precedent names in the media language, especially, there are two different stylistic purposes in newspaper headlines: first, the word (precedent name), which is the basis for a familiar topic from the culture or history of the country, and it comes to the reader’s attention immediately. Such a title will encourage the reader to read the article. For this reason, a communicative connection is established between the reader and the author. This is what caused various thoughts in the reader’s mind: “what did the author mean when he used this word?”, “this word would have come from this story, which I know” creates an internal dialogue of criticism. In the minds of the reader, who has fallen into such an inner wave of thought before to read the article, the likelihood of believe, accepting the information in the text of increases (Takehiko Y., 2001).

A precedent name is a historical event that influenced the emergence of this word, serves as a bridge between the memory of the situation and this situation that takes place today. More precisely, it contributes to the rapid perception of familiar information, regardless of the current situation. Thus, an associative chain is born in the reader’s cognition and a semantic space is established (Sanjay S., 2014).

The ability of precedent texts, full of content that can attract the attention of the public, is an indispensable tool for newspaper headlines that keep the reader’s attention in the spotlight. For example, “winter is long in our side”. The basis for this precedent name is the story of the famous writer O. Bokey “winter on our side is long”. When the journalist who founded the conversation put the title of his article “winter is long on our side” (HSE, 20.10.2019).

It was intended to draw the reader’s attention to the impressive description of the flood in the Tarbagatai District of the East Kazakhstan region. Also, the writer M. Auezov gives a feeling of disgust to the 13-year-old girl Gaziza in the story “the day of the defenseless”, who was subjected to violence, abuse and the tragic fate that ended in death. It is when this “day of the defenseless» becomes the headline of the newspaper that the public consciousness, to remember the fate of Gaziza, takes pity on the fate of the baby, which sold abroad and feels the need to stop (AT. 02.12.2017).

Karaulov Yu.N. gave the following definition of the term precedent: “we mean a linguistic unit, it is the

texts, that can have an emotional and cognitive impact on a particular person with the aim of referring to similar situations in each era as well as in the public environment surrounding of him" (Karaulov Yu., 1987). Along with Y. N. Karaulov, I.V.Bagaeva, V.V.Krasnykh, D.B.Gudkov, I.V.Zakharenko, who touched about this topic, which emphasized that the term precedent is a very broad concept and proposed to divide it into 4 parts:

1. precedent name
2. precedent pronunciation
3. precedent text
4. the precedent situation (Krasnykh V.V, Gudkov D.B, Zakharenko I.V, Bagaeva I.V, 1997).

Among the four different precedent structures mentioned, the one, that finds the most usage is the precedent pronunciation. Stable phrases, verses, proverbs belonging to precedent pronunciation are very convenient to present as a subject "ready-made template" are structures. For example, "the same rock is one rock" (SS. – 06/27/2018), "the letter of the scientist does not die..." (SS. – 18.05.2021), "It will be added to the blanket of the city administration" (Ja. – 09.09.2019), "A younger brother grows by looking at his elder brother" (SS. – 13.05.2016).

The practice of "fragmentary use" of subjects, that come to present the initial part to the subject and apply the second part is also often encountered with precedent utterances. The goal is to increase the effect, to over-clock the thought. "The fifth wheel of the cart: Are those with hip piercings still enjoying a soft pillow?" (ZhA. – 16.08.2021), "Again about Arkankergen and Aksai Gorge or "Achilles' heel" (ZhA. – 11.09.2021) (Yergalieva K., Asanbayeva E., 2015).

The headlines of newspapers made of precedent pronunciations can be divided into two: precedent pronunciations that have undergone changes, which used without any changes. However, changing precedent pronunciations have little effect on readers. This is because the minds of the people tend to accept the unchanged version of precedent pronunciations. However, in the language of newspapers, there is often a modified use of the idea that the reader wants to express in accordance with the content of the article. This is due to the activity of the newspaper to influence the reader (Dinee S., 2013).

The scientist G. K. Ihsangalieva divides the methods of "change" of modified precedent texts into three types: quantifiable, qualificative, mixed types. In the quantifiable form, one sentence in the composition of a precedent text is replaced by another word or another word is inserted. According to the qualitative approach, not a whole particle in a precedent text is subject to phonetic, that is, alphabetic changes. Well, in the mixed approach, this approach is used alternately (Ihsangalieva G., 2000).

The Russian scientist S. I. Smetanina deeply studies the use of precedent texts within a journalistic text, highlighting several types of ways to include precedent phenomena in the "media text". "Text A is another author's, "text B" is his own (author of the article) (Smetanina S., 2002).

1) text A is equivalent to text B: "if you want to be a country, fix your cradle" (HSE. 13.01.2021), "if your name does not come up, burn the Earth" (horse. 12.07.2018), "there is no insult in caution" (P. 2001 No. 7). Text A is related to text B semantically and is used as a subject without any changes. On the basis of the same background, the author's own idea is text, which is given. In this case, the citation of the title is enclosed in quotation marks.

2) an example of a text that is equivalent to text A and text B: "What makes you thirsty, quench your thirst" (P. 2017. No. 4), "An eagle goes hunting in Kansonar..." (P. 2006 No.9). In these examples, the reporter expresses through quotes that the subject is not his own.

3) text A is the basis for writing text B. In this approach, intertext communication is very complex: text A is a fragment of text A is text B.

3.1. to short the text and add a new meaning to it: "The bullet fired by the father" (HSE. 08.06.2012). If the full version of this proverb is based on the upbringing that parents give to the child, then the first part of it is taken for the title. In the end, we can find out that the article is talking about the place of the father in raising children. In addition, in these articles, only parts of the precedent texts are taken. "When the girl grows up, the beauty of the country" (P. 2013. No. 4). In fact, this is the full version of the proverb: "If a girl grows, the beauty of the country, if flowers grow, the beauty of the Earth". In the same way, the use of the proverb "A good name will never die, a scholar's letter will never die" is widely used in the press. For example, an article about the Republican scientific conference dedicated to the memory of a historical scientist, Professor, academician T. S. Sadykov was called "the letter of a scientist does not die" (SS. 18.05.2010).

3.2. Disclosure of the meaning with the addition of the text. For example, it is known that during the period of December events, the phrase "you have broken the hearts of young people, December" was formed in the mouth of the people. And now the article, which touched upon the fate of the girls who took part in the December events, is guided by this precedent name. In particular, the phrase "You broke the girls' hearts, December!" changes to. (SS. 28.11.1996). Also in the vernacular there is the phrase "health is a great wealth". He draws the attention of the public by creating the basis for the title of an article describing the situation of a people who are negligent in maintaining public health and expresses the soul: "we say that health is a great wealth" (HSE. 02.11.2019).

3.3. Situational, alternating use of words depending on the purpose of the topic. For example, changing the popular proverb "Where there is a ditch, there is water, and where there is water, there is water" to "Where there is death, there is mourning" and presenting it in the title can attract the reader's attention (HSE. 26.11.2012). The phrase "Oyan, Kazakh" (the theme of the poem) by M. Dulatov, known to six Alash, is used skillfully in the title of the article by the correspondent, who spoke about the good results of the summit in Astana: "Kuan, Kazakh!" (HSE. 20.10.2010).

If you have a midday life, folk wisdom calling for the day's cattle collection "take care of winter in summer!" I mean, six months of winter and summer. All Kazakhs are used to do this. It was very successful to test the Heat Transfer Center, which showed that when winter came, it could not add to heat the housing, and even showed that it was not ready for it, and the title of the exposing article changed this precedent: "summer your winter sleigh!"

Research results. The title of the article, which implies that the governors and who did not elect the winter sleigh in the summer, also which will now receive their punishment in December and demonstrates the irresponsibility of the governors for the situation that torments the country (HSE. 24.09.2010). In conclusion, the title of the article was used purposefully to demonstrate the powerful position of the head of government, who puts this issue before the governors.

Many of the precedent names that form the basis of newspaper headlines are taken from versions that have a public meaning. For example, the use of Abai's poems "we study in a boarding school, many Kazakh children" as "we study in construction, many Kazakh children" increases the expressive tone of the article (HSE. – 13.04.2021). In general, it is common for verses in Kazakh poetry to be included in newspaper headlines as a precedent name. For example, "Ayagoz, where are you going?" (D. Babatayevich), "Kerey, where are you going?" (Bukhar zhyrau) poem "Yrys, where are you going?" (P. 2004 №4), "Media, where are you going?" (HSE. 18.03.2021), "history, where are you going?" (HSE. 10.10.2017), which became the basis for many newspaper headlines.

The next approach found in using precedent names as article titles is to complicate the article title by supplementing precedent names with words. For example, "Male and female: will the rights of two halves and one whole be equal?" (HSE. 18.11.2016). "Will the hostage be retaliated against?" (HSE 21.05.2021).

The title has an informative, naming, pragmatic function. The name function of the title in the newspaper informs the information and the function of evaluating the event in the text is observed. The informational function of the topic is unique in the concise, visual, and also impressive presentation of the thought expressed in the text. It is considered a communicative function of the topic. In this way, the topic, performing an informative function, affects the reader's knowledge. As a result, the topic forms a conceptual-thematic network and serves as an analysis and explanation, to convey the idea and content of the text through language units (Tereszkiewicz A., 2012).

The subject acts as a (pragmatic) influence on the reader and contributes to the reader's good perception of the text, performing secondary tasks. Such sub-services of the topic include evaluative value, graphic interpretation, advertising, integrative services (Seib P., 1997). While this main service includes a constant feature in relation to the text of any newspaper, secondary service can be reflected in different levels in each text. In understanding the meaning of the topic in the newspaper, the knowledge of the reader is very important.

For example, "Secret like his sister-in-law" (EQ. 06.03.04).

Although this topic seems familiar (jenge is one of the Kazakh family names. It means to express one's thoughts without bending and the close relationship between like-minded and close people), it is not known what content it refers to in this text. That is, what conditions were the basis for choosing the topic, it becomes clear only after reading the entire text.

According to the upbringing in a Kazakh family, where one sees one's sister-in-law as a mother, one cannot hide any secrets from her. Therefore, it is clear that there is an open conversation between the characters in this popular article. Here, such a familiar theme from the folk culture to the life of the country will have a special effect on the reader. In the reader's mind, it creates an association with such concepts as "friendship", "compassion", "care", which increases the reader's interest in reading the text of the article. We can see that the theme is connected based on the nature of the action described in the text.

Expressive, evaluative tone, playful, figurative topics have a high potential to influence the reader. Such headlines inform the reader about the content of the newspaper and influence the perception. (Morley J., 1998) In addition to the precedent names that have such an impact on the society, it was noticed that there are more contrasting topics in the modern Kazakh press. It is observed that modern newspaper titles are developed in terms of information and impact on the reader. (Jar-mul D., 1991)

The evaluative character is reflected in its expressive and emotional tone. In other words, it becomes a tradition to use words of national cultural significance in modern press materials in order to encourage and "power" the reader to study the newspaper text. For example, "If you're safe, you'll be safe" (Allah preserves those who are cautious), (EQ. 22.05.04); "To swallow a camel was a light diet" (JA. 22.11.15), "Each singer is boiling in his own cauldron" (JA. 01.01.14), "A smiling boy is good for a laugh" (ZhA. 22.11.17) etc.

Newspaper headlines always aim to influence the reader. Its system of cognitive to think is based on elementary knowledge. As a result, it becomes the main pillar of the position of the organizing team, which forms a whole newspaper.

It is not a matter of fact that the themes are taken from poems of poets familiar to the reader. Its impact on the reader will increase. Especially, such newspaper headlines are often taken from precedent names. This shows the strength of the pragmatic potential of precedent names in our language for the reader. There are three types of its creation:

1) Allusion. It defines the names of prose and poetry works. For example, "Khamit who chased the gang" (JA. 01.08.19), "Which way will you become a brick?" (T. 08.08.19)

2) Allusions in the name of movies. "Intertwined destinies" (EQ. 30.06.18), "The rich people also cry" (EK. 12.24.15).

3) The names of songs, anthems and popular works as titles. For example, "Almaty is the capital city" (AZ. 17.12.15), "Love is an eternal fairy tale"

(AZ. 17.01.14), "Goodbye, Sandro, see you soon..." (AZ. 27.12.05).

After all, predicate nouns are linguistic units, that can affect a certain person emotionally and cognitively. Precedent linguistic units are words that affect a person from a cognitive and emotional point of view. It is words familiar to the person and its surroundings (Evans H., 1974).

In relation to this issue, scientist S. Imanberdieva prefers to use the term logoepestime highlighted by G. Kostomarov and N. Burvikova in her scientific article "Transformation of logoepestimes in mass media" (Imanberdieva S., Egizbaeva N., 2015).

Logoepestima is very extensive in terms of knowledge and information. In this regard, the author can add the values, according to his position. Logoepestime is one of the most effective methods that interest the reader today. We can call this a method that has penetrated intensively into the Kazakh press and began to show its results.

Logoepestima is a new, surprising method by nature (Simon-Vanderbergen A.M., 1981). Therefore, it is easy for the reader to accept. Although it is playful, it has a significant pragmatic load. In this way, it not only fulfills the role of playfulness, but also performs an evaluative function. Finally, the following conclusions can be drawn about logoepestime:

Firstly, logoepestime is an indicator of the author's position. How the journalist evaluates the issue can be seen from the headlines, which are already familiar to the masses;

Secondly, the logoepestime acts as a bridge between the author and the reader. Such precedent names, which are an indicator of national identity specific to a certain culture and are unique from newspaper materials.

Thirdly, any logoepeptic use demonstrates the journalist's skill to use the vocabulary and the desire for innovation.

Discussions. In the process of working on the topic, there was a need to determine the level of influence of precedent names on young people. At the same time, "what is the influence of precedent names to read the text?" a survey was conducted among students on the topic:

During the questionnaire, respondents were asked 5 questions. In particular, 97 (64.6%) of them are respondents from 18 to 23. The survey involved 85 (90%) women and (10%) 15 men.

Do you know what titles are made up of the first "precedent names"? "80 respondents said 'yes' and 20 respondents said 'no'.

"Can titles consist of precedent names pay attention to themselves and create an internal dialogue within the reader? "75 respondents said yes" and "25 respondents said no".

"Is there an immediate interest in reading when you see headlines made up of precedent names?" '85 respondents said yes' and '25 respondents said no'.

"Were there any points where the headlines made up of precedent names contributed to your point of view and prompted you to change your decision?" '75 respondents said yes, and 25 respondents said no'.

"Does the purpose of headings usage to make up of precedent names to think?" '70 respondents said yes and 30 respondents said no'.

As a result of the questionnaire, it was found that topics consist of precedent names actually have an impact in the minds of young people. The main task, which face the headline of the newspaper is to influence the reader's mind, to motivate him to form a point of view. And in a result, it is proved how effective is to use precedent names as newspaper headlines.

Reporter-scientist N. Uali's conclusion as a result of his research can be compared with the results of the survey. According to the scientist, precedent names enrich the press text with emotional meaning. It shows the dimension of internal culture characteristic of a journalist, forms an image (Uali N., 2007). We can see from the results of the questionnaire how much the headings consisting of precedent nouns affect the reader's cognition and encourage them to read the text itself.

Conclusions. The title to the text of the newspaper is not only a function of the title of the content of the article, but also the essence of the game, professional position and attitude that the author would like to express through this article. From this point of view, newspaper topics have a very high ability to push society. The study and recognition of this task of the newspaper theme observed in the course of the experiment is relevant in any era.

The purpose of the article is, as a result of scientific research, to determine the precedent task of newspaper headlines, which contributes to the formation and development of national consciousness, influencing public consciousness.

The theme of the newspaper involves, first of all, attracting the attention of the reader. Also, giving the article a symbolic title, increases the attractiveness of the newspaper. At the same time, newspaper headlines containing precedent names have a very high potential for impact, increasing the pictorial nature. In order to differentiate scientific works on newspaper topics containing case names, to generalize the theoretical concept, conclusion and its practical study, it was proved as a result of the survey that case newspaper headlines are linguistic means that have a special impact on public consciousness.

The question raised in the article was analyzed from the point of view of the pragmatics. In the course of the study, the questions of questioning students were considered from the point of view of a pragmatic position, and were not based on theoretical questions. As a result of the survey, it was proved that scientific results, in fact, have the ability of newspaper headlines to influence public opinion. The results of the survey showed that the precedent newspaper topics are a potential force for influencing, exciting, and influencing the public consciousness.

The activity of newspaper headlines, which consisting of precedent names, to form a public opinion is always very important. After all, newspaper headlines have a special place in increasing the readability of articles and texts become a driving force for national consciousness.

Newspaper headlines with a precedent name are a value that can contribute to the formation of the national identity and integrity of today's society, convey cultural and historical information. Therefore, especially, it is relevant to analyze the professional skills of journalists who reproduce precedent words with their modified use through scientific research. Such researches demonstrate, firstly, the function of precedent names in the formation of public consciousness, and secondly, the style of the press is the power of the literary language.

Newspaper headlines consisting of precedent names are an indispensable tool for influencing and arousing interest in the reader's mind. The specifics of the formation of headings were analyzed on the basis of examples, which is formed in using precedent names in this article. The pragmatic meaning of precedent names in the style of the press is revealed.

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ON THE TREATMENT OF CULTURAL REFERENCE: A CASE STUDY IN ENGLISH AND ARMENIAN

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Abstract

The Article examines the nature of idioms in the frame of two different languages with their unique cultures. It's well-acknowledged that idioms are fundamental literary components, fostering depth and genuineness. The three core notions specifically compositionality morphological and syntactic constraints of idioms are portrayed in the article with special reference to James Joyce's "Dubliners" and its Armenian translation, emphasizing the cultural historical background covered in idiomatic expressions.

The study provides profound insights into translating idioms for emphasizing the importance of cultural and linguistic intercommunication between cultures through literature. James Joyce's idiomatic expressions serve as an actual illustration, highlighting the intricate balance that translators need to convey intended meanings while maintaining authenticity.

Keywords: idiomatic expression, morphological and syntactic constraints, cultural and historical background, paraphrase, omission, compensation.

Introduction

An idiom is defined as a constituent or series of constituents for which the semantic interpretation is not a compositional function of the formatives of which it is composed (Fraser, 1970; p.22).

The importance of idioms in any language cannot be doubted. Their ubiquity makes them anything but a marginal phenomenon, and surely a linguistic theory has an obligation to explain them in a natural way (Chafe, 1968; p.111).

According to Armenian linguist P. Bediryan, an idiom is a stable, ready-made, reproducible reinterpreted association of words, where the independence of the component words is formal, and the syntactic connection is obscured (Bediryan, 1973).

From a semantic perspective, idioms function in sentences as single words on behalf of their invariability and their metaphorical meaning, which is attached to the whole phrase and not to the individual items that constitute the idiom. Idioms involve a special kind of collocation. For example, *kick the bucket*, not only obtains the collocation of *kick and the bucket* but the fact that the meaning of the resulting combination is opaque. Opaque meaning is not connected with the meaning of the individual words, however, it is sometimes (though not always) nearer to the meaning of a single word (thus *kick the bucket* equals *die*) (Palmer, 1976: 98). A. Cruse claims that (2000), in most cases, it appears vain to search for the meaning of individual constituents of an idiom, as the constituent parts do not possess any meaning. The whole meaning of a phrasal unit is related to the phrase and not to its constituent parts. Therefore, idioms are regarded as single units from the semantic point of view. To underline the former ideas, a view, which is similar to A. Cruse's definition is provided by Palmer advocates who write that idioms, semantically, are single units. But they are not single grammatical units like words (Palmer, 1976: 41). The difference between words, phrases, and idioms is that an idiom is a phrase or expression that has a meaning that in most cases cannot be deduced directly from

the individual words in that phrase or expression. There is a blur line between idioms and other multiword units and since the mentioned characteristics might be common among them, it is difficult to differentiate between idioms and multiword units.

A. Sukiasyan (2004) highlighted certain distinctive features between:

- **Idiom and word combination** The main difference between them is that word combinations are created in the process of communication, so they are not stable and permanent units. While idiomatic expressions are unchangeable units, having specific framings.

- **Idiom and set expression** These two units have the value of a single word, but an idiom has a completely metaphorical meaning; it is a figurative expression, its meaning cannot deduce from the meanings of its constituents.

- **Idiom and word** Finally, an idiom is a group of words that has an established meaning which cannot be derived from the constituent parts. Hence, words construct the frame of idiomatic expressions.

As it has been already mentioned, even where an idiom functions semantically like a single unit, it does not function like a word grammatically. For example, the idiom *keep a straight face* (to remain serious) will not form past tense in the usual pattern by adding -ed at the end of the phrases **keep a straight-faced*, though it will function in a sentence as a verb,

e.g. *She couldn't keep a straight face while she was telling the story.* The whole phrase functions to some extent as a usual sequence of grammatical words, so that the past tense form is kept a straight face (Longman Dictionary of English Idioms, 1979).

However, there exists a large number of grammatical restraints. Plenty of idioms are formed by a verb and a noun, but although the verb may be transformed in the past tense, the number of the noun has to remain untouched. In the case of *red herring*, the noun may be plural, but the adjective cannot take comparative or superlative forms (Palmer, 1976).

Besides the morphological restrictions, syntactic restrictions occur as well. The syntactic restrictions are predominantly represented by passive forms, as some idioms have passive and others do not. A transitive verb phrase usually can be transformed from the active voice into the passive one. However, in case of idioms, the presence of a transitive verb does not imply that the idiom can be changed into the passive form. For example, the phrases give up the ghost and kick the bucket involve transitive verbs (give up, kick), still none of them can be transformed into the passive form *the bucket was kicked (Longman Dictionary of English Idioms).

Averaging across a wide spectrum of theories, we can advocate that in spite of a lack of unanimous agreement among scholars, there are three notions overwhelming in all the definitions of idiomatic expressions: compositionality, institutionalization, and degree of frozenness or fixedness. First, the idioms are non-compositional since their meanings are not the sum of the meanings of their parts; secondly, they are institutionalized which means they are commonly used by a large number of people in a speech community; and finally, the idioms are frozen and fixed i.e. but the degree of their frozenness varies (Grant, 2003). Consequently, it is usually a pretty complex or even unenviable project to translate an idiom into any other language without any preceding expertise of its meaning in context. However, we are prone to think, that idioms are figurative expressions with obscured syntactic connections which are not easily translated into another language.

The Conveyance of English Idioms in Armenian

The major concern of this part of the research is to outline the peculiarities and strategies of idiom translation, touching upon cultural, religious, and contextual characteristics. We shall draw out our attention to the perspective of a non-native speaker, who may encounter a number of difficulties when recognizing and translating an idiomatic expression.

- You can never know women.

‘She’s all right,’ said Corley. ‘I know the way to get around her, man. She’s a bit gone on me.’ (Two Gallants, p.76)

-Կանանցից դժվար է գլուխ հանել

-Կարգին աղջիկ է, պատասխանեց Քորլին - Գիտեմ, թե գլուխը ոնց եմ յուղելու Համ էլ իմ վրա խփնված է (էջ 61/2)

‘Get around something/someone means -to find a way of dealing with or avoiding a problem/person’ (Cambridge Online Dictionary), and is considered as phrasal verb which is translated as an idiom in Armenian. -Գլուխը յուղել is interpreted as -to lie to someone, trick or deceive, fool (Bediryan, 2011, 315p.). Consequently, the translation is successful and equivalent.

“Gone on” is slang from American English and means -to be in love with (Collins Dictionary), so one of the most colloquial expressions is used here in the target language.

Խփնված լինել is also a slang and expresses the notion of loving someone too much.

- She counted all her cards again before sending Mary up to Mr. Doran's room to say that she wished to speak with him. (The Boarding House, p.87)

...տիկին Մունին մի անգամ էլ ծանր ու թեթև արեց իր բոլոր հաղթաթղթերը (էջ 78/2)

Count cards is a set expression which can be literally used as -to keep track of the cards that have been dealt and those that remain in the deck, in order to calculate the likelihood of certain hands in gambling games such as poker and blackjack. The same phrase is used with a high idiomatic degree here, since it means to think about something carefully before doing it (Farlex Online Dictionary of Idioms). The translation has achieved its full equivalence. The English verb “count” is outlined in the target utterance, however, this omission is compensated by the verbal construction -ծանր ու թեթև անել (to think thoroughly) which in the combination with the noun -հաղթաթուղթ (cards of victory=

-հաղթել+թուղթ+եր) enhances a metaphorical meaning and frames an excellent paternity of idiomatic phrase that is so comprehensive for an Armenian reader.

- ‘I met some of the old gang to-day,’ said Ignatius Gallaher. ‘O’hara seems to be in a bad day. What’s he doing?’

‘Nothing,’ said Little Chandler. ‘He’s gone to the dogs.’ (A Little Cloud, p.95)

—Այսօր նախկին հրոսակախմբից մի քանիսին եմ տեսել,—ասաց Իգնատիուս Գալահերը,—Օ’Հարան ինձ ինչ-որ դուր չեկավ Ինչո՞վ է զբաղվում

— Ոչ մի բանով,— պատասխանեց Փոքրիկ Չանլլերը,— շան օրն է ընկել (էջ 43)

If a person is going to the dogs, he is -becoming very much less successful than he was in the past, much worse in quality or character (Macmillan English Dictionary). The origin of this expression is believed to be in ancient China where dogs, by tradition, were not permitted within the walls of cities. Consequently, stray dogs roamed the areas outside the city walls and lived in the rubbish thrown out of the city by its inhabitants. Criminals and social outcasts were often expelled from cities and were sent to live among the rubbish – and the dogs. Such people were said to have gone to the dogs, both literally meaning the place where they were now to be found, and metaphorically in the sense that their lives had taken a distinct turn for the worse. In the adduced extract, it touches upon the metaphorical perception of the phrase, since it illustrates the poor condition of the hero. -Շան օրի is explained as -անտանելի ծանր, խեղճ վիճակում (in an unbearably grievous, poor condition) (Bediryan, 2011, 1016p.). In Armenian, -շան օրը գցել, -շան քթից ջուր խմել,

-շան տեղ չդնել idioms already show, that -dog is equivalent of being poor, ignored in Armenian. The Armenian verb -ընկնել means -14. փխբ. կործանվել, տապալվել, 16. բարոյական անկում

ապրել (to perish, to fail, to slump morally) (Aghayan, 1976, 408p.). Consequently, it fully conveys the notion of becoming very much less successful. So the translation is equivalent and accurate, not causing any clashes between the coded message and receptors.

• „Half time now, boys,“ he used to say light-heartedly. „Where’s my considering cap?“ (A Little Cloud, p.93)

— Տղանե՛ր, մի պահ ընդմիջում,— անփութորեն ասում էր նա,— ու էս գլխիս զոռ կտամ (էջ 40)

Put on a thinking cap means -to begin thinking or considering very carefully and seriously about something (TheSaurus Online Dictionary). The term thinking cap denotes an imaginary cap humorously said to be worn in order to facilitate thinking. The earliest instance that was found is from the Western Carolinian (Salisbury, North Carolina) on October 16, 1821:

We advise the editor to put his thinking-cap on, before he hazards another such assertion. The earlier term was considering cap, and this variant is used by J. Joyce. In The History of Little Goody Two-Shoes, an anonymous children’s story published by John Newbery in 1765, a chapter is titled The whole History of the Considering Cap, set forth at large for the Benefit of all whom it may concern. On the left, you can find the original illustration of the considering cap.

By the point of folk etymology, it is often said that *thinking cap* is an allusion to the official cap donned by a judge when the time comes to deliver judgment or pass a sentence. But the contexts of the early uses of considering cap and thinking cap are not judicial. These terms are purely metaphorical. As B. A. Pythian explains in -A Concise Dictionary of Phrase and Fable (1993), in the days when everyone wore headgear, caps denoted a wide range of professions, trades and status, it would have been natural for someone who was asked to think about something putting on their thinking cap. Additionally, in the earlier normal term, considering cap, the alliteration suggests a popular metaphor, not a specific reference to a professional thinker such as a judge⁹.

In Armenian, գլխին զոռ տալ means լարված մտածել, ենթադրություններ անել (to think tensely, to make assumptions) (Bediryan, 2011, 333p.). Consequently, here the idiom is also associated with the process of thorough mediation, and the words գլուխ and cap are contextual synonyms, embracing the notion of brain, intellect. The English interrogative sentence is translated into the Armenian affirmative structure without any loss of meaning. Hence, the translator has reached full equivalence, finding the appropriate and comprehensive idiom in Armenian.

• „Tommy,“ he said, „I see you haven’t changed an atom.“ (A Little Cloud, p.95)

— Թոմի,— ասաց,— տեսնում եմ, որ մազաչափ անգամ չես փոխվել (էջ 43)

An atom is -the smallest unit into which matter can be divided without the release of electrically charged particles. It is the smallest unit of matter also that has the characteristic properties of a chemical element¹⁰. It

is very fascinating to see how artistically the translator managed to make an analogy between the size of an atom and hair as a mass of thin fibres in Armenian to show that there is no even tiny difference in a person’s behaviour. Մազի չափ/մազաչափ is explained as բոլորովին, դյուզն, ոչ մի չափով (by no means) (Bediryan, 2011, 897p.). It goes without saying, that the relevant variant in the target language perfectly fits to the original one unleashing cultural values in comparative languages. Cultural differences are successfully found out, and the correct phrase has been artistically chosen here.

• She’ll have a good fat account at the bank, or she won’t do for me. (A Little Cloud, p.100)

Կամ նա բանկում չաղլիկ ընթացիկ հաշիվ կունենա, կամ էլ՝ թող գրողի ծոցը գնա (էջ 49)

“Do nothing for/to someone” is demonstrated as not to have a strong and positive effect on someone, or not to be something that someone likes or enjoys (Cambridge Online Dictionary). In Armenian, գրողի ծոցը գնալ has a negative meaning, either.

Գրող/Չոգեառ is an Armenian traditional belief, a spirit that writes down the actions of a person during his life. According to these actions, it becomes clear what kind of person he is. It is probably related to Tir, the god of education and writing in Armenian mythology. In the Christian era, it was mistakenly imagined as a Christian spirit, which no longer writes down the life deeds of a person, but foresees the fate of every person and writes it on people’s foreheads. From now on, other Christian concepts were also attributed to it, for example, the role of the accuser in God’s judgment. Գրող is sometimes identified with the archangel Gabriel. Finally, the Armenian began to imagine him as an evil spirit, identifying him with the devil (there is a curse: “գրողի ծոց”, which originally meant death, to die)¹¹. Here the equivalent is taken from the right source, keeping the main idea of the original phrase.

• You wait a little, my boy. See if I don’t play my cards properly. When I go about a thing I mean business, I tell you. You just wait. (A Little Cloud, p.100)

Մի քիչ սպասիր, բարեկամս Կոտեսնես, թե ինչպես եմ պարզելու առաքասոներս: Եթե որևէ գործ բռնեցի, մի կասկածիր, սխալ չեմ անի Սպասի՛ր, կտեսնես (էջ 49)

To play one’s cards right means to do something intelligently, to execute a well-thought-out plan successfully, to behave in a way that anticipates others’ reactions in order to get the outcome one wants (Cambridge Online Dictionary). The idea comes from the fact that in order to execute a winning hand in a card game, one must understand the strategy of the game and play the cards logically and well. The growth of the popularity of card games in Western culture gave rise to many idioms including have an ace up one’s sleeve, to hold all the cards, and to get lost in the shuffle. While the expression play one’s cards right can be found as far back as the 1600s, as an idiom it gained popularity quickly in the latter 1900s. The idiom առաքասոները պարզել is explained as -խիզախորեն ճանապարհ ելնել, ուղղվել դեպի (to

set out bravely, head towards) in Armenian (Bediryan, 2011, 132p.). The link between sails and cards in the translation sounds logical: both of them need precise attention and knowledge to be successfully controlled, the victory comes only if both are consistently managed. One more fascinating detail of the translation is that the negative sentence is transformed into the affirmative one without any loss of meaning. The translator has perfectly chosen the equivalent phrase in Armenian, avoiding misinterpretation.

- He tried to weigh his soul to see if it was a poet's soul. (A Little Cloud, p.93)

Նա փորձեց իր հոգու խորքը նայել, ստուգելու արդյո՞ք դա բանաստեղծի հոգի էր (էջ 41)

In the idiom weigh soul we find a religious motif, since the weighing of souls (Ancient Greek: psychostasia) was mostly seen in medieval Christianity and used to assess a person's life by weighing their soul (or some other part of them) immediately before or after death in order to judge their fate. The context is not religious, since it is about having and estimating

the sense of poetry and muse that a person should have to become a poet. The Armenian phrase -հոգու խորքը նայել amplifies the following thought: understanding one's values and peculiarities (Bediryan, 2011, 781p.). In the translation, weight and նայել are equal verbal phrases describing the same notion of estimating oneself and can be considered contextual synonyms too. The translator succeeded in finding an equivalent with an evaluative stance.

- „Hello, Crofton!“ said Mr. Henchy to the fat man. „Talk of the devil...“ (Ivy Day in the Committee Room, p.140)

— Բա ըն, Քրոֆթոն,— ասաց միստր Հենչին հաստիկին, շան անունը տուր... (էջ 99)

-Speak/talk of the devil is an idiomatic expression you say when the person you were talking about appears unexpectedly (Cambridge Online Dictionary). The term is a shortened version of the phrase Speak of the Devil, and he will appear. This proverb appears in England during the Middle Ages as an admonition against the danger of uttering the name of the Devil, Satan or Lucifer. The fear of acknowledging evil by name may be seen today in the Harry Potter series, where only the bravest characters will call Voldemort by his name.

Շան անունը տուր, փայտը վերցրու ձեռքդ is a famous Armenian proverb/saying, which means a person you are talking about will appear soon. It is of great interest that in the Armenian variant the constituent շուն (dog) plays the same function and the noun devil in English. E. Aghayan distinguishes the following meanings of dog:

3. անհամակրելի՝ հարգանք ու վստահություն չառաջացնող մարդ, 4. փխբ. խորամանկ, վարպետ, հնարամիտ մարդ, 5. փխբ. անառակ, 6. փխբ. անարգ, չարագործ մարդ (unsympathetic, a person who doesn't inspire respect and trust, cunning, a dishonourable man) (Aghayan, 1976, 1124p.). It becomes obvious that

there are similarities in the semantics of the nouns devil and dog. The chosen idiom clearly indicated the original message and touched upon the matter of equivalence.

- „This is Parnell's anniversary,“ said Mr. O'Connor, and don't let us stir up any bad blood. (Ivy Day in the Committee Room, p.142)

— Այսօր Պարնելի մահվան տարելիցն է,— ասաց միստր Օ'Քոնորը,— եկեք հին դարմանը քամուն չտանք (էջ 102)

If someone -stirs the blood, it -makes you feel excited (Cambridge Online Dictionary), in our extract, -bad blood circulates, and the idiomatic meaning is mostly about making you feel upset and sad. The Armenian idiom with similar meaning, but dissimilar form հին դարմանը քամուն տալ is used for the translation. The Armenian idiom is explained as

վաղուց եղածը մեջտեղ բերել, հիշեցնել (to remind something that happened a long time ago) (Bediryan, 2011, 379p.). The Armenian noun դարման means հացաբույսերի մանրացրած ցողունը, հարդ (chopped breadfruit stem) (Aghayan, 1976, 284p.). Դարմանը քամուն տալ can be understood literally either since it's the action of throwing chopped stalks of breadfruit into the air. The same we do with someone's memory, recalling things from the past and reminding about something. Here is another extract showing how

idiomatic expressions reverberate the objective reality in language as mirrors. The translator has artistically used appropriate idiom, balancing between target and source readers' cognition.

- ...that the committee was going to move heaven and earth to secure a bumper house on Saturday. (A Mother, p.149)

...և հանձնաժողովը երկինք ու գետին իրար է խառնելու, որպեսզի շաբաթ օրը լիքը դահլիճ ապահովի (էջ 175/2)

Move heaven and earth means -to do everything you can to achieve something (Cambridge Online Dictionary). It is about putting tremendous effort into accomplishing something, doing everything one can to make something happen. The expression move heaven and earth came into use in the 1700s, but its origin is uncertain. Some believe that it is related to Archimedes' statement: -Give me a lever long enough and a fulcrum on which to place it, and I shall move the world. However, Archimedes lived in the 200s B.C. and the idiom did not come into use until 2,000 years later. Others attribute that the idiom is from Bible, Haggai 2:6: ... I will shake the heavens and the earth, and the sea,

and the dry land... Երկինք ու գետին իրար խառնել completely illustrates the idea of the original idiom, so the translator has artistically found an accurate solution.

2. She remembered the last night of her mother's illness; she was again in the close dark room at the other side of the hall and outside she heard a melancholy air of Italy. (Eveline, p.66)

Հիշեց հիվանդ մոր վերջին գիշերը, նա պառկած էր դահլիճի մյուս կողմում գտնվող

մութ սենյակում, իսկ դրսից լսվում էր իտալական մի թախծոտ մեղեդի (էջ 35)

These are of great interest cases when various idiomatic expressions that are architected with the same constituent air are used in the various contexts and rendered not similarly. An air (Italian: aria; also ayr, ayre in French) is a song-like vocal or instrumental composition. The term can also be applied to the interchangeable melodies of folk songs and ballads. It is a variant of the musical song form often referred to (in opera, cantata, and oratorio) as aria.

In these two examples, the word air is translated differently: տալսկտ and մեղեդի. We are prone to think that in the first example, the translator meant the symmetrical sound of patting on the stone and singing a song. However, in the second illustration, the air was much more emotional and described the dramatic atmosphere of the story, it was like a background music, so Armenian word մեղեդի is chosen. The component of traditional folk music is kept in the second example due to the adjective իտալական, but not in the first one, since տալսկտ is defined as a unit of time into which the musical work is divided according to the number of metrical accents (Aghayan, 1976, 1407p.).

- Gallaher's heart was in the right place, and he had deserved to win. (A Little Cloud, p.91)

Գալահերը բարի նպատակներ ուներ և արժանի էր հաղթանակի (էջ 37)

Her/his heart is in the right place is used to say that someone has good intentions (Cambridge Online Dictionary). The ancient Egyptians believed that the heart, rather than the brain, was the source of human wisdom, as well as emotions, memory, the soul and the personality itself. Despite modern medicine, prose and poetry still allude to the importance of the heart, especially regarding love and emotions. Since we feel our heart rate increase during times of increased blood flow, and emotions, it's easy to understand the connection²⁰. In Armenian, we find idioms with the constituent սիրտ, for example, ոսկի սիրտ ունենալ, սիրտը մաքուր, սիրտը բաց (Bediryan, 2011, 1152p.), etc., however, the translator has nicely rendered the phrase by using paraphrase.

- Mrs. Donnelly told her husband it was a great shame for him to speak that way of his own flesh and blood but Joe said that Alphy was no brother of his and there was nearly being a row on the head of it. (-Clay, p.119)

Միսիս Դոնելին ասաց ամուսնուն, որ այդ ձևով հարազատի մասին խոսելը շատ անոթ է, բայց Ջոնը ասաց, թե Օլֆին այլևս իր հարազատ եղբայրը չէ, և վերջում քիչ էր մնում հասներ վեճի (էջ 72)

-Someone's own flesh and blood is -someone's relation (Cambridge Online Dictionary). The phrase flesh and blood may be used in a general sense to mean that someone is human, mortal, or a material part of nature. When someone is referred to as being someone's flesh and blood, it means that the person is genetically related to that person. For instance, your son would be your flesh and blood. The earliest known use of the idiom

flesh and blood may be found in an English translation of the Bible that dates from the year 1000, known as the Anglo-Saxon Gospels. The same passage appears in the King James Version in Matthew chapter 16, verse 17:

...Blessed art thou, Simon Barjona: for flesh and blood hath not revealed it unto thee... The Armenian circulating variant is -մեկի միսն ու արյունը, which means -հարազատ ժառանգը (direct descendant) (Bediryan, 2011, 950p.). The word -ժառանգ is not random in this case, since it was peculiar to the ancient times to inherit the throne to the elder son, who had blood relation with the royal family. The translation is done with the word

հարազատ, which means 1. ուղիղ գծով արյունակից, 2. ազգական, 3. բարեկամ, մտերիմ, 4. սիրելի, թանկագին (blood relative, close, dear person) (Aghayan, 1976, 841p.). The translator has professionally chosen the adjective հարազատ avoiding clashes between source and target text messages.

The thin edge of the wedge, said Mr. Henchy. (Ivy Day in the Committee Room, p.139)

—Հենց այսպես էլ սկսում են,—ասաց ծերունին

— Համեստ, բայց խոստումնալից սկիզբ,— ասաց միստր Հենչին (էջ 99)

The original variant of the idiom the thin edge of the wedge is the thin end of the wedge, however, it is believed that J. Joyce wanted to create a phonetic harmony in the pair of -edge-wedge. This is a doublet (two distinct words derived from the same source but by different routes of transmission), and the phrase dates back to the mid-19th century, it refers to the thin or pointed end of the wedge. A wedge is often made from metal or wood and is used as an axe blade. With the thin end, it can be used to slowly divide an object into pieces, hence its meaning of something may have little importance but can cause serious development later on. The English pair edge-wedge is rendered as համեստ-խոստումնալից (modest-promising). This correlation utterly indicates the slow but constant development, and the occurrence of the conjunction բայց (but) yields to a contrast, giving a colorful touch to speech. The translator has opportunely applied paraphrasing, transforming an idiom into a non-idiom expression.

- In a few minutes the women began to come in by twos and threes, wiping their steaming hands in their petticoats and pulling down the sleeves of their blouses over their red steaming arms. (-Clay, p.116)

Քիչ անց, շրջագզեստի փեշով սրբելով գոլորշախաշ ավերը, բլուզների թեւքերը իջեցնելով կարմրած, ուռած դաստակների վրա հայտնվեցին կանայք (էջ 69)

In the translation of -Dubliner the omission initially appears in -Clay, the omitted unit is

-by twos and threes, which is an archaic phrase and means -a progression of people arriving or leaving from somewhere (A Daily Updated Dictionary of English Idioms). In addition, -in twos and threes option is explained as two and three at a time, in small numbers. The translator generalized all these features under the verb -հայտնվել and omitted the part

-how. However, the translation is coherent and explicit.

The translation operates as a form of intercultural transfer, opening up a source text to new readers in a new language, where it will most commonly be read as if it were originally written in the target language.

James Joyce, one of the most influential writers of the 20th century, was known for his use of idioms in his works. Joyce's writing often incorporated local Irish expressions, colloquialisms, and idiomatic phrases, which added a layer of authenticity to his characters and their experiences. Idiom translation in literature is a specialized area that requires expertise and attention to cultural and linguistic details. A proficient translator must have the necessary skills and knowledge to handle the specific challenges of translating idioms, which play a crucial role in language and communication.

CONCLUSION

Overall, idioms play an important role in literature by adding depth and authenticity to a writer's work, as well as creating an emotional connection with the reader. Idiom translation in literature is a specialized area that requires expertise and attention to cultural and linguistic details. A proficient translator must have the necessary skills and knowledge to handle the specific challenges of translating idioms, which play a crucial role in language and communication.

James Joyce, one of the most influential writers of the 20th century, was known for his use of idioms in his works. *Dubliners* is a great example of a literary work full of idioms, which were used as expressive means of imagery, clarifying the author's position, defining the purpose of his work and giving the reader a clearer notion of Ireland. Joyce's writing often incorporated local Irish expressions, colloquialisms, and idiomatic phrases, which added a layer of authenticity to his characters and their experiences. In this novel, Joyce masterfully weaves together different forms of English and Irish idioms, making the language itself a character in the story. By incorporating idioms, Joyce created a sense of place and culture, immersing readers in the world of his characters and their experiences. Joyce's use of idioms was not just a stylistic choice; it also reflected his belief in the power of language to capture the essence of a place and its people.

This study advocates that idioms are expressions that carry a specific cultural and historical context, making their accurate translation a challenging task. The major concern of this investigation is to outline the peculiarities and strategies of idiom translation, touching upon cultural, religious and contextual characteristics. Successful idiom translation requires an in-depth understanding of both the source and target languages, as well as the cultural nuances of the idiomatic expressions. The translation operates as a form of intercultural transfer, opening up a source text to new readers in a

new language, where it will most commonly be read as if it were originally written in the target language.

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THE SECTION BLACK WITHIN THE DICTIONARY OF CHROMATIC POETIC LANGUAGE (MIRCEA CĂRTĂRESCU, NICHITA DANILOV, FLORIN IARU, BOGDAN GHIU, ION STRATAN)

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Abstract

The present study concerns a dictionary section, entitled *BLACK*, within the *Dictionary of Chromatic Poetic Language*, which is the result of an extensive study (published in some specialized journals) focusing on the poetic chromatic phenomenon based on the poetry of the Monday Cenacle members, led by Nicolae Manolescu.

The dictionary section entitled *BLACK* aims at investigating the values and poetic meanings of the chromonym “black” and the lexemes belonging to its semantic-poetic field (articles based on the authors: Mircea Cărtărescu, Nichita Danilov, Florin Iaru, Bogdan Ghiu, Ion Stratan that make up the Section *Black* (the Interpretation and Analysis part).

The investigation has an inter-and transdisciplinary character, encompassing linguistics (poetic lexicography), literature, psychology, visual arts, computer science. The metalanguage used shall be within the scope of interdisciplinarity, being circumscribed to several related theoretical fields: the theory of the imaginary, literary semiotics, stylistics, poetics, hermeneutics, reception theory, visual arts, ethnography, psychocriticism etc.

Keywords: Black, chromatic, Dictionary of Chromatic Poetic Language, poetic meanings

The possibility of elaborating a Dictionary of Chromatic Poetic Language, is based on the correlation between color, on the one hand, and the author’s imagination, sensitivity and vision, on the other. The author’s consciousness and unconsciousness, his/her instinct and spiritual forces, feelings, exercises of reverie (in bachelardian terms) are found in his/her undertaking the universe of colour through the act of creation [20, p.37].

In this context, it is necessary to point out the theoretical framework of our lexicographic enterprise as stated in other studies: the tradition and experience of developing poetic dictionaries in Romanian culture (everything that means development methodology, analysis grids, research tracks, etc.) registers a crucial moment in Romanian poetic lexicography through the contribution of IT specialists who, in 1999, through an automatic lemmatization program within the „Babeş-Bolyai” University of Cluj, created under the coordination of Marian Papahagi the *Concordance of B. Fundoianu’s poetry*. Later, the same model served as basis of the *Dictionary of Eminescu’s Poetic Language – The concordances of anonymous poetry* (2002), Botoşani, Axa Publishing House, 2 volumes, developed within the Faculty of Letters of the University Al. Ioan Cuza from Iasi under the guidance of professor D. Irimia. The second component of the *Dictionary of Eminescu’s Poetic Language*, which, in fact, represents the object of our main interest, is the *Dictionary of Signs and Poetic Meanings*. vol. I. Arts (2005), vol. II. *Primordial elements* (2007). Highly acclaimed in the experts’ metalexigraphical reflections as a modern work for its interdisciplinary openness and for its structure (Ioana Vasileoiu), the Dictionary under discussion offers a lexicographical vision, “closer in conception to the Dictionnaire des symboles, done in coordination with Jean Chevalier and Alain Gheerbrant” [8, p. 5].

The macrostructure of the *Dictionary of chromatic poetic language*, built on the model of the *Dictionary of Eminescu’s Poetic Language* (Iasi), contains 2 main components (The *Concordances* and the *Dictionary of Signs and Poetic Meanings. Interpretation and Analysis*) and some secondary headings (**Encyclopedic Appendix: a) A medallion (the author’s photo)**, then b) **Brief biobibliographic data**; c) **Ethnographic information regarding the respective color**; **Illustration**).

The nomenclature of the respective Dictionary has been extensively developed in another study; here we will only reiterate that the overall architecture begins with the *Black* color and ends with the *White color*, and between the two are the fundamental primary colors (*Blue, Red, Yellow*) and the secondary ones (*Green, Orange, Purple*). The entries are not organized alphabetically (an already established criterion), the methodological criterion is used. Therefore, each volume will interpret not only the poetic meanings of the chromonyms per se (which will stand as titles of the volumes) – the *primary core*, but also other signs integrating into the semantic-poetic field of the corresponding color, constituting sub-addresses or sub-entries – *secondary core*. At this stage, we cannot estimate the exact number of *entries* in the dictionary, the literary reality will determine the extension, taking into account the possibility of a possible asymmetry (one volume can contain a large number of entries, while another on the contrary – each volume will have its own design).

The necessity and possibility of developing a dictionary of chromatic poetic language is substantiated by:

- *common reasons for research*: it is directed, as a rule, to variability, intrinsic quality of the way of existence and functioning of the language, and, in particular, to stylistic (diaphasic) variability manifested in the subjective level of speech; it develops knowledge of stylistic resources of chromonyms; allows the **automatic**

processing of texts in order to develop *Color Concordances*,

• *specific reasons for research*: it configures the literary phenomenon (imagination, author's vision, aesthetic sensibility) mediating one of the relevant components for the perception of the world - chromatics (the relevance of color in literature); thanks to the *Concordances* component, the dictionary can serve as a base-support for new applications in linguistic research in general. Thus, the dictionary will become a source of information that facilitates the understanding and interpretation of the literary phenomenon and linguistic research.

• *didactic reasons*: an effective working tool in ensuring the acquisition by undergraduates and master's degree philology students of the competences **to understand the mechanism of the language functioning in its entirety; a useful tool in substantiating and deepening the knowledge of the literary phenome-**

non, of the author's creativity and of the stylistic potential of an important lexical area for profiling the author's vision, fancy and sensibility, or literature creators go beyond the color itself, looking for its "inner" beauty;

• *motivational reasons*: **the idea of such a dictionary presents a challenge to specialists because of the complex problems it poses, requiring interdisciplinary research;**

• *reasons for synchronization and innovation*: **connection with the priority trends in modern lexicographic culture abroad, homologation of research and the contribution to the development of the field of poetic lexicography.**

Below, we present the lexicographic articles based on the authors: Mircea Cărtărescu, Nichita Danilov, Florin Iaru, Bogdan Ghiu, Ion Stratan that make up the **Section Black (the Interpretation and Analysis part)** in the Romanian and English versions:

Black

Mircea Cărtărescu



Sourcing photo: <https://ploiestitv.ro/2023/04/23/solenoid-de-mircea-cartarescu-premiat-de-los-angeles-times/>

b. June 1, 1956

Volumes of poetry:

- Headlights, Shop Windows, Photographs (1980);
- Air with Diamonds (collective volume, 1982);
- Love Poems (1983);
- Everything (1985);
- The Levant (epic, 1990);
- Love (1994);
- Double CD (anthology volume, 1998);
- Pluriverse (2 volumes, anthology, 2003);
- 50 Sonnets by Mircea Cărtărescu with Fifty Drawings

by Tudor Jebeleanu (2003);

- Double Album (2009);
- An Evening at the Opera (2009);
- Nothing. Poems (1988-1992) - (2010);
- Never ask for Help" (2020).

„Black is the color of sadness, sorrow, evil heart. Black is the grim hell of the other world, black is the devil and black are all the evil spirits. Only the dog, the cat and the black

A poetic sign that develops two directions of meaning in Cărtărescu's poetics: (I) Cărtărescu's black, assimilating the projection of the opaque archaic black (valences of fecundity, fertility); it builds up in an intimate color of maternal femininity that accompanies the embryonic vision and defines love as the equivalent of creation; (II) a reflex eminently of the funeral, the macabre, expression of death.

I. Black is strongly valued by M. Cărtărescu, being the essential chromonym around which the entire vision of the poem *Love* is built, where we are dealing with a hyper-representation of black, a true display of black, which we can say "spills over", returning 24 times within the limits of the same text and confirming once more the anarchic spirit proper to postmodernism. Black appears in association with a recurring motif in the author's work - the rainbow - the black rainbow (a black rainbow had risen above the mother). It is a black colour with effects of saturation and vibration – *it was a black rainbow and because of so much sparkling black/ the chamomile had darkened in the field*.

Totally absent from the spectrum, black becomes an invading color in Cărtărescu's rainbow, suppressing the other ones: red, orange, yellow, blue and indigo, except for the purple: *the red of the rainbow was black / and its orange was black / and its yellow was black / and its green was black / and its blue was black / and its indigo was black*. The colors here merge "like Cărtărescian lovers, passing into each other" [3, p. 281]. This cancellation of the chromatic barriers of the rainbow refers to the idea of an orgy, but here it is an orgy of black. Thus, the black rainbow, de-canonized, with modified definitional chromatic parameters, reduced to black and purple (a new order of the rainbow!), becomes for Mircea Cărtărescu a metaphorical equivalence of love as creation, understood in the initiatory sense, as a "ritual orgy" implying the elimination of

birds are kept at the man's house, which "the Evil one" cannot approach.

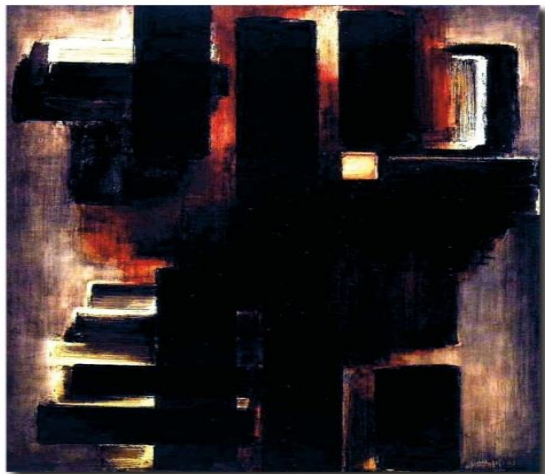
Black eyes, however, cause special love and sympathy among Romanians. He says that For eyes like blackberries/I bypass the woods! Black hair, whiskers and eyebrows are an ornament: His mustache, /is like the plume of a crow...The dark complexion is not unpleasant either, on the contrary, it is quite often pleasant, because "the black earth bears the best fruits!"

However, Romanians do not like black clothes and we meet entire counties where, apart from a black cap or hat, nothing black is worn. And if we meet this color in fabrics for the home, it only makes up the field on which there are various designs, colored in different facets.

When someone dies in a house, the remaining members don't put on "bright" clothes, but "dark" ones, with red and black background. "The dyeing of the soul" cannot be shown in the black robe, which is commonly missing" [18, p. 162].

"The Romanian women make the black color with bark and grains of black alder, with bark of plum and walnut, with walnut shells, with oregano, with branches of sorghum and mulberry, with bean pods, with dandelion flower, with cinnamon, with sour stone, sea salt, green vitriol and with the rust of the streams and stagnant water." [idem, p. 38].

Paintings



Pierre Soulages, juillet 1953. Sourcing image : dépliant "Les sujets de ... vertetplume.com

all borders, complete merging up to the "return to the primordial, chaotic state" from which creation arises. Mircea Cărtărescu's orgies tend to acquire fabulous proportions, engaging everything in their mechanics - time, space, ontological registers, also contaminating the register of the inanimate ontological referential, the banal world of the everyday concrete, the surrounding objects, etc.: love! the radiators roared/- love! the curtains/- love! the auto parts stores/- love! the rats.

The chromatic austerity of the Cărtărescu rainbow, pushed to the level of monochrome (the purple finding its archaic sub-black meanings) descends to serious accents of meaning and primordial symbolism of black. Understood in this way, the black rainbow becomes a profound symbol in the economy of the poem, through which the author restores the archaic, dulled resonances of blackness. Loaded with the prestige of origin, black, in the equation of the poem, refers to its primordial, fertile and fruitful valences. It is precisely this dimension that is essential and relevant in Cărtărescu's concept of Eros. The black rainbow outlines the fertilizing idea of Eros, in the sense that its finality is fruition, creation, metamorphosis (change of the initial state). In their seeming incompatibility, the elements of the association rainbow + black (the black rainbow), oppose and evoke each other, at the same time, if we place ourselves in a register of the symbolic understanding of things. Black is seen in direct relation with a certain feminine spirit, with maternal femininity. The black rainbow imagined with "soft, organ-like pipes" symbolically sums up a form of maternal femininity, related to that of spaces - natural cavities, sui generis wombs that portends the embryonic vision. In this line of ideas, black denotes the intimate color of maternal femininity. There is also a game of labyrinthine forms present here: the "soft, organ-like pipes" of the black rainbow leave impressions of labyrinthine gorges, configuring a geometry of sexuality. Black here appears as an adjective that involves the intimacy of the "subject" [1, p. 73]. Following Bachelard's line of thinking, we may say that black, denoting a quality by definition, in the poem, is not so much a "state" as a becoming.

Black "has all the colors", all the powers, sums them all up and refers to the inner powers of matter. The prodigious image of the black rainbow is built on a paradox, on opposite values (on a deep discord!) that boosts anarchic effects. The black color, in this dialectic of things, would be "the intimate abode of colors" [ibidem., p. 26]:

and all the black objects cast colored shadows

and the shadow of mother, father, cast a colored shadow

It would be interesting, in this order of thought, to reveal Gilbert Durand's opinion, according to which, in general, the color "always refers us [...] to some substantial femininity"



Kazimir Malevich, *Black Square* (1915).

Sourcing image: <https://artfilemagazine.com/black-square-by-kazimir-malevich/>



Vassily Kandinsky, *Pointy black* (1931).

Sourcing image: <https://artvee.com/dl/pointy-black#00>

[10, p. 275], "multi-coloration being directly linked [...] to the engram of maternal femininity, to the positive worth of women, of nature, of the center, of fertility" [*ibidem.*].

Cărtărescu's Eros takes on ritual forms, being spectacular and fabulous through the hyper accumulation of descriptive elements, overwhelming due to the viscosity of the macroscopies and microscopies of a delirious fantasy (there was a ship made of cobwebs / traveling on the edge of the black rainbow / like on the edge of a border trimmed handkerchief).

The poem reveals a framework that assimilates the values of a fertilization ritual in which the black color plays a primary role, individualizing the "objects of worship": the "black plate", associated with the symbolism of the "vessel", the container, through the symbolic representation of the place where miracles take place, the womb in which a new birth is conceived, the reservoir of life [6, p., 429]; the milk ("a thread of black milk"), "the primordial food, the food archetype" [11, p. 320], becomes the vehicle of the black color, implicitly, of fertility/maternity. "The black woman" suggests the cult of the Great Mother, the primordial mother, the prima materia (in specialized literature the kinship between mater and materia is highlighted), and in the verse a tram driver enters a black depot, a euphemism for sexuality/fertility is outlined, a postmodernist foreshadowing of the fulfillment of sexuality:

a cat opened its eyes and saw a black plate

in which a black woman poured him a bit of black milk.

a tram driver entered a black depot.

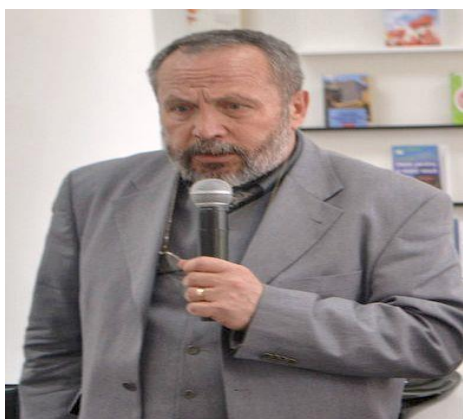
a butterfly sat on a black wall.

only the rainbow still sparkled

throwing black flames

II. Correlative of death, the black color updates the eerie, mournful, tragic register: *death will come. highlights will be black. the photos will still retain a black breath.*

What makes the lyrical selftragically feel the imminence of the end is the fact that death confiscates the possibility of loving in a telluric (corporeal) way by dematerializing the being: crystal eyes, how about doing without a place to make love (...); We will laugh blackly between our fingers full of lips/when they will tear the needle and the skin of our cheeks/and we will not be able to love, separated by the blanket with bars; the photographs will slowly unfold the petals/in the wind that scatters on the tram tracks/snow and organs (Elegy. After Catullus). Black reflects the attitude of the poet, imbued with a bitter taste in the face of this fatality. At the same time, we notice the evanescence of the metaphysical dimension of Eros.

Black**Nichita DANILOV**

Sourcing photo:

https://ro.wikipedia.org/wiki/Nichita_Danilov

b. April 7, 1952

Volumes of poetry:

- *Cartesian Wells* (1980);
- *Black Field* (1982);
- *Harlequins by the Edge of the Field* (1985);
- *Poems* (1987);
- *Over Things, Nothingness* (1990);
- *Ragged Ear* (1992);
- *The Blind Bridegroom* (1995)
- *Over Things, Nothingness/ Au dessus des choses, le néant* (1997, bilingual edition translated by Emanoil Marcu);
- *Nine Variations for Organ* (1999);
- *Scene with walls and doors* (2000, Romanian - English bilingual edition (translated by prof. Sean Cotter, University from Michigan, USA);
- *Souls from Second Hand* (2000);
- *In the desert and on the waters* (2000);
- *The Golden Shadow, Melancholy* (2000);
- *THE CENTURY* (Junimea Publishing House, 2003);
- *Second Hand Souls* (2000);
- *Nouă variațiuni pentru orgă/ Nine Variations for Organ* (2004);
- *The Black Angel* (2003, translated in Russian by Elena Loghinovski);
- *Ferapont* (2005);
- *Chastity Belt* (2007)

A poetic sign that reveals its own duality, (I) interfering mainly with the paradigms of death, fratricide sin, loneliness, pessimism, deformity, as well as with (II) the paradigm of birth.

Characterized by a picturesque and a remarkable visual expressiveness ("la qualité maîtresse"), becoming a veritable "poetry of the eye", Nichita Danilov's poetry privileges a particular chromatic dominant - *black* - which the poet accepts in the form of a "concentrate of inner tension" through which he manages to obtain maximum expressiveness and meaning with an obvious economy of means. Although the poet cultivates a pictorial poetry (a poetry of the eye), all the force of the black in this case, lies "beyond the eye", in the imaginative force, in the "labyrinths" of the connotative field of the black, which in N. Danilov's work becomes "a color from which one cannot escape". The poetic paradigm of black interferes here with the paradigms of death, fratricide sin, loneliness, pessimism, deformity, etc.

The poem *Cain*, for example, evoking the biblical scene of fratricide, records 12 occurrences of the black chromonym. Thus, the *black* color in *Cain* is a more meaningful black, "a blacker black" than in other poems in which we find it, as it also offers a "visual show": it is a subtle transformation of the reader's / "viewer's" perspective: the pulsation from the inside of the black.

(*Cain*, Cain, /why are you so **black**, /Cain? (*Cain*) penetrates outward, resonating chromatically (the evoked scenery/phenomena become "blackened" (the snow is black and wet (*Cain*); the rain is **black** and cold (*Cain*). The black associated with rain and snow gives the feeling of flow, fluidity, saturation, it becomes visual, penetrating, tactile, hiding in its substantial concentrate the feeling of deep evil. The black in the poem *Cain* becomes a semantic, "tentacular" key point, with an extension throughout the text – "center of ideational and aesthetic irradiation".

The concentration of the entire biblical episode and its drama in an aesthetic formula of a chromatic nature - black - a preliminary formula of sin - this is the author's original stylistic solution, demonstrating another way of capitalizing on the poetic resources of the given chromonym. The autonomous value of black is weighty in itself (in the collective cultural mindset), but also its combinative force in the oxymoronic constructions "black snow", "black rain" is impressive – "the meeting of opposing things".

The reader thus becomes a "witness to/participant in" the fratricide through the sensation that this particular black provides. The recurrence of black and the unusual associations impose a certain kind of vibration on black, amplifying the desolate atmosphere,



Brudermord, Cain and Abel (1919).

Sourcing image: <https://artvee.com/dl/cain-and-abel-brudermord-2#00>



Odilon Redon, La Mort – mon ironie dépasse toutes les autres!(1889)

Sourcing image: <https://artvee.com/dl/la-mort-mon-ironie-depasse-toutes-les-autres-death-my-iron-surpasses-all-others#00>

which makes you feel these “precipitates” of black in the depths of the flesh, the biblical character Cain himself dissolves in this spectacle of black. Thus, black in N. Danilov’s poetry becomes a dominant, about which we can say that here “the black embraces you and by embracing you, you can no longer look at it, it is the black that looks at you”, recalling Malevich and his square, of which you cannot escape, it holds you captive to its color. If we try an exercise of intersemiotic translation (Umberto Eco), the entire poem could be translated into the language of painting through Malevich’s black square.

The index system is also a marker of the synergy of the given poetic text. The synergistic potential of the index (in fact, this is an indexical cumulation: the disjunctive conjunction OR + the adverb MAYBE) of textualized poetic paradigms manifests itself in the tendency to semantically homogenize the heterogeneity of the textualized poetic paradigm (“what semantics distinguishes the index unifies”, i.e. establishes a higher level semantic homogeneity, establishing interparadigmatic relations within parallel textualizations)

It’s snowing OR MAYBE it’s raining
Through snow OR MAYBE through rain
The man is white OR MAYBE black
Red OR MAYBE black birds
It’s snowing OR MAYBE it’s raining
It’s raining on the field OR MAYBE it’s snowing
It’s snowing OR MAYBE it’s raining
Through snow OR MAYBE through rain
His hair is blonde OR MAYBE black
It’s snowing on him OR MAYBE it’s raining

We notice the paradigmatic index OR, without the adverb MAYBE in 2 occurrences towards the end of the poem, which attests to the definitive semantic homogenization, the total contextual equivalence of the associated elements (white=black, blue=black).

His face is white OR black
His eyes are blue OR black

Textualized poetic paradigms are extremely contradictory, or, as Crisu Dascălu stated in his work *Dialectic of Poetic Language*, it is contradiction that is the “sufficient condition for the existence of the paradigm as a whole” [7, p.32].

The poem also involves other levels of meaning through the recurrence of symbols related to the biblical episode of Cain’s fratricide (the lamb...) which also acquires artistic force due to its obsessive character and the combination with chromatic lexemes (the red lamb). The associations structured with the help of given chromonyms fully articulate the semantic sphere of fratricide in the text. The construction “field of corpses”, with 7 recurrences in



Vassily Kandinsky, Landscape with a trumpet-blowing (1909).

Sourcing photo: <https://artvee.com/dl/landscape-with-a-trumpet-blowing-rider#00>



William Blake, Cain flees (1825)

Sourcing photo: <https://www.artbible.info/art/large/624.html>

the text, also participates in the global process of signification: the plural here can implicitly mean the murder of all the descendants of Abel - an entire tribe, but also the "living corpse" of Cain in addition to Abel's. Thus, black is the color of Cain, the color of lack of faith, sin, disobedience, etc.

The analysis of the occurrences of the poetic sign *black* in N. Danilov's poetry reveals the fact that it is found, essentially, in the following poetic paradigms:

Death - the **Black** Angel (*The Black Angel*) - the **black** bell (*The Black Angel*) - the **black** shadows of crosses and churches (*The clay is disturbed and mixed again*) - Since then we fall into a **black** halo (*Poem of the Gates*) - A **shadow** falls over my father (*Son of Man*) - I lie under the ground and listen to the **black** song of the night birds (*April Month*) - **Black** sun, sun of the end, light up my song (*April Month*) - The **Black** sun (*Lullaby*) - A **black** bird is screaming, floating above the barren landscape (*The Season Clock: coming out of winter*), etc.

Birth - A kind of luminous **black** or a cool, bright gray (*Twilight*)

The human being: The man is white or maybe *black* (*Cain*)

Mythical/biblical beings: _ Cain, Cain, /why are you so **black**, /Cain? (*Cain*)

Parts of the human body: face - His face is white or *black* (*Cain*); **eyes**: his eyes are blue or **black** (*Cain*); **hair**: his hair is blonde or maybe **black** (*Cain*); His hands were big, his locks were **black** and his eyes were of deep blue (*The Sacrifice*)

The natural animal ontology: And while he is thinking/ a procession/drawn by four **black** horses comes out of the city (*The Man with A Pipe*)

Inner states: The anguish/the remorse: Red or maybe black birds/ circle over his crest and scream (*Cain*)

Sin/evil: Tens of times raised to the **blackest** power!

(*Universe in balance*) - An increasingly **black** wind was blowing through the streets (*The 20th Century*)

Sadness/Loneliness: Just a great and endless restlessness. The **black** restlessness of solitude (*The Poem of the Gates*) - A sad Wednesday, a **gray** day (*A Sad and Grey Wednesday*) - Like two calm and pale lotuses as **black** as black waters. Ah! (*Poem O*) - Accompanied by a **black** flock (*Serene*)

Refuge: I'm looking for a nook, a black hole, a canal mouth in the azure / to hide like a terrified rat, forever, forever (*Arpeggios*)

The natural cosmic meteorological ontology: The snow is **black** and wet (*Cain*); the rain is **black** and cold (*Cain*)

In an effort to conceptualize the key moments of existence (death and birth), the *black*



Picasso, The musician (1972)

Sourcing image: <https://artchive.ru/pablocicasso/works/487488~Muzykant>

reveals its own duality: in the poet's vision, both death and birth "come out from under the same chromatic garment" - death (*black angel; black sun*) - birth (*light black*).

In conclusion, **black** in N. Danilov's poems is large ly overlaid with the paradigms of death, fratricide sin, loneliness, pessimism, deformity, etc. The semantic-poetic vectors of black in N. Danilov's work, although they identify with nuances/stylizations and aesthetic refinements, still are not far from the matrix of the Romanian collective mindset in which "The black color stands for sadness, grief, sad heart. The black is the grim hell of the other world, the devil is black and all the evil spirits are black" [18, p. 162].

BLACK
Bogdan GHIU



b. July 5, 1958

Volumes of poetry:

- The Poetic Work (2017);
- (The Cardboard Poem) Traces of destruction on Mars (2006);
- The Author's Manual (2004);
- Pants and Shirt (2000);
- Archipelagos (1997);
- The Art of Consumption (1996)
- The One-Meter Side Poem (1996);
- The Author's Manual (1989)



Vassily Kandinsky, Trente (1937).

Sourcing image: <https://www.centrepompidou.fr/en/ressources/oeuvre/ca9ELe>

A poetic sign that participates substantially in structuring the imaginary in Bogdan Ghiu's poetry, namely by referring to the chromonym white. Thus, the black color, through symmetry, postulates the existence of white and vice versa, configuring a poetic imaginary in the colors of the chess game – black and white: *The white dot (which already exists)/and the **black** dot (which I put down) (Two dots (Poem))*. Decisive for Bogdan Ghiu's imagination, the black and white chromatic opposition refers to charcoal drawing or engraving, and sometimes to graffiti art. The poet, as a true engraver, who uses the fundamental signs – the dash and the dot – to obtain complex images, capitalizes on the dot, the simple fundamental and extremely economical sign (white dot, black dot) to express profound visions. In this context, it is appropriate to evoke the symbolism of the dot: “The geometrical definition of a dot is that of an abstract quantity that does not consist of parts, and, therefore, it is invisible and immeasurable. The dot gives rise to and also marks the extremity of a line, but it also constitutes the “boundary condition of the abstraction of a volume” and has a complex symbolic meaning: that of the center, origins, fire, the principle of emanation and its duration return; moreover, it indicates the creative power and the end of all things” [4, p. 209].

In general, the chromatic opposition of black and white is associated with elements-concepts of writing: the page, the period, the letter, etc. The chromatic spectrum attributed to the concepts mentioned above is extremely poor: in addition to black and white (in a chromatic duet as a semantic-poetic duet), we also record serene (1 occurrence), red (3 occurrences), green (3 occurrences), gray (1 occurrence).

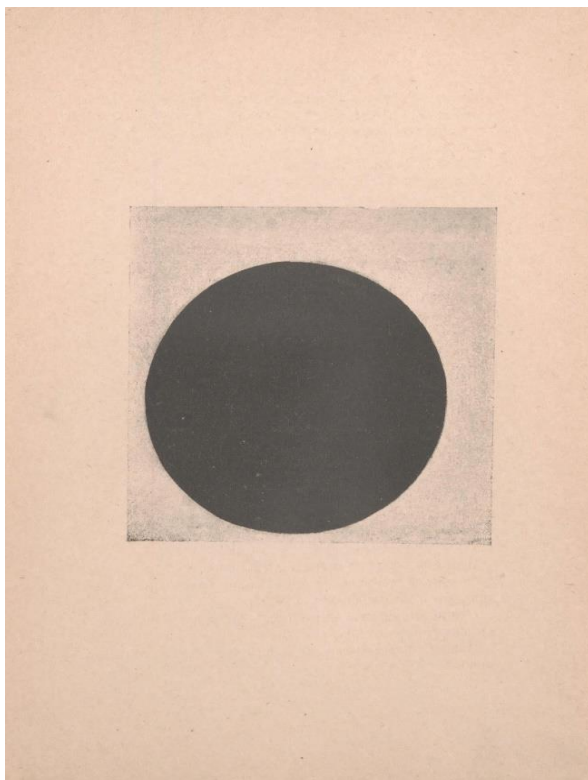
In the poem *The Mission and the Poet's Destiny*, we explicitly find the image of the dot as the world (or the world as a dot): *To show us how far we can go and from what distance, looking back, over the shoulder, the world becomes a dot, which is already a letter, large, empty, with which something else begins (the promised text)*

Bogdan Ghiu tends to explain some of his poetic concepts himself, probably out of concern for the way his writing is received by the lecturer. Thus, the poem *Daniel, Virgil (a celebration and an explanation)* illustrates this fact: *The poets line up not one above the other, but side by side, like two letters placed to promise meaning. They are buried where meaning lies, close at hand, near, below, here. From a living, **blackletter**, with the prisoner's blood, which alone fills the page and makes the word, the text, everything, they gradually become a **white**, empty **page**, which we are given to write on [...] The poets' mission is to become a **white**,*



Johannes Molzahn, Roar of Space (1919).

Sourcing image: <https://artvee.com/dl/roar-of-space#00>



Kazimir Malevich, Black Circle (1919), Sourcing image: <https://artvee.com/dl/black-circle/#00>

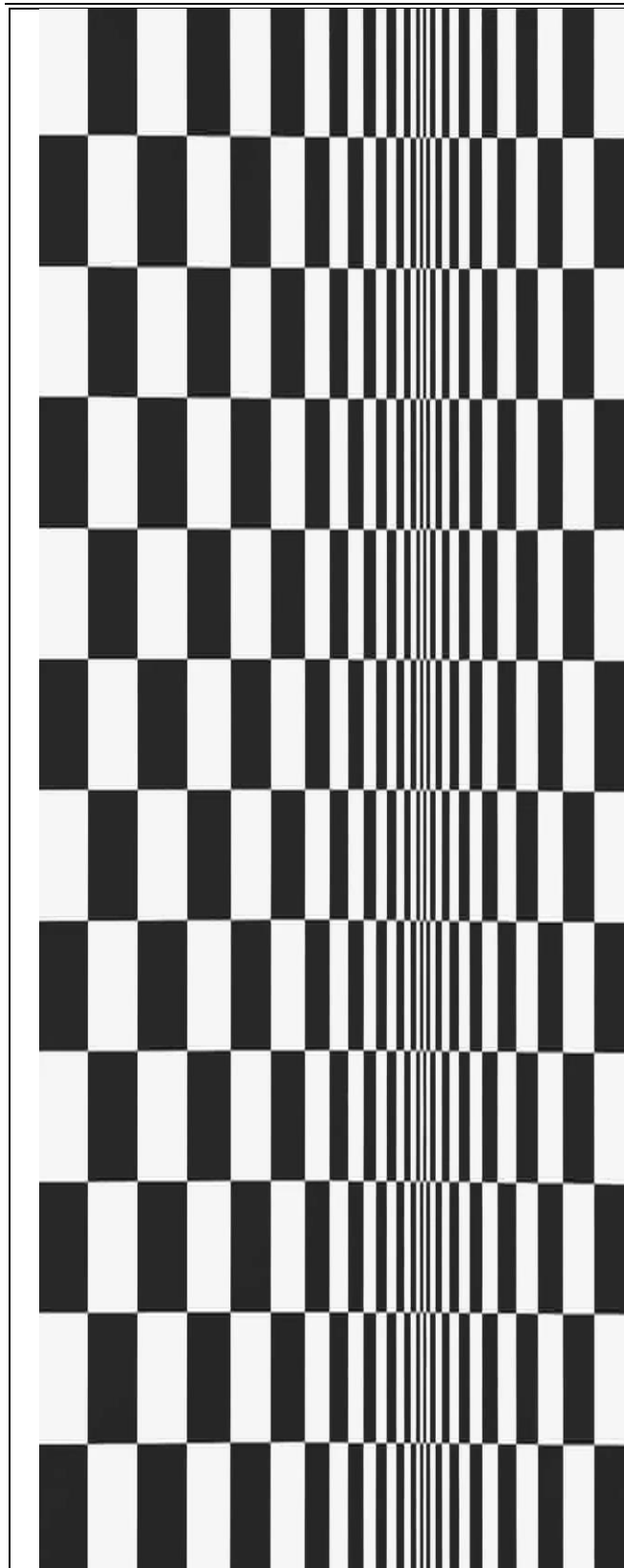
living, dazzling **page**, in which the meaning of future writings is buried. Their words are a writing table. A page that already turned into word, that cannot be read, because it was not written. He who has ever sat in front of a white page (...) cannot go(...) beyond it. He won't be able to stay here. No matter how hard he tries to just write, to glide, to be able to get back with the black, his pen tip will tear the paper, come out (descend) into the world. He, who, the only one, has ever stood above, has felt how many times his being has become the starry sky of this place.

From a semiotic point of view, the black and white chromonyms constitute a system¹ in the poetic code called Bogdan Ghiu in which the white dot is the expression of the creation of the world/divine, and the black dot - of the creation of the poet. Just as each element of a semiotic system/code structures its units of signification due to correspondences with the other element or according to the relations it maintains with it, the question arises whether the white dot and the black dot (the white and the black) are polar opposites, if they are irreconcilable, mutually exclusive?(With my writing, which is getting smaller, more closed, like cacti in the desert, trying to fill the large, cold, already written pages of the world/ Me, to write between the lines of others, over them. To turn the black page, written with heavy pressure, into a white, light page again. I do not write to fill pages, but to clean the only ones that exist, to provide white, clean pages (Fragment). Ultimately, what does this game of black-white opposition (regardless of the nature of the determinate) imply? There are poets who do not even write, who only prepare the future blank pages of poetry (Daniel, Virgil (a celebration and an explanation) or You write and write, the text goes on the page, covers the page with text, with more and more pages of text, which are no longer pages, but text, little by little you become a page, white, empty, threatening, unbearable. You yourself are reduced to the white page within you. You become a simple, clear sentence. Against the clause that is the world. The only one. (Poem. To Mircea Ivănescu)

They made us sensitive to emptiness! Their writing spreads like a black page over the face of the world, black over her black eyes

I write with a period. I write with the period and I can't stop. I will cross-hatch the page! I will divide it and then color it black; "The Murder of Babies" "The Murder of Cockroaches". I give up writing. I cross-hatch and color.

White dot – black dot; white page – black page; simple sentence – clause; "The Murder of babies" – "The Murder of cockroaches" - all



Bridget Riley (1961), Movement in Squares

Sourcing image:

<https://artsandculture.google.com/asset/movement-in-squares-bridget-riley/dwGpQ5o3Dc4FrQ>

these are images of two worlds: The world of divine creation - the world of poetic creation(writing). It is similar to the same principle as in the game of chess, where “the very fact of putting two values in opposition gives the black or white their meaning. In this perspective, neither the white nor the black pre-exist opposition. These oppositions are purely negative: the value of black is not to be white and vice versa” [17, p.120]. The black here develops the meanings of creation, through black the poet-writer becomes the “emitter”/ “creator” of black semantic worlds on the white page, these two dot worlds obviously having common valences. You don't have to write much, write just to signpost: there is no smoke (black, negativity, shadow) without fire, but let the fire be heavenly (the “origins” already gone, essentially evanescent: alive through black traces) (Non-poetry). This symbolic black-and-white register enters into a fascinating chromatic alchemy *sui generis* reversible in the sense that the white becomes black and vice versa in Bogdan Ghiu's crucible of writing: *To turn the black page, written with heavy pressure, into a white, light page again* (Fragment); There's only one page for/ everyone when it's over I get back/till it becomes **black**, corpulent (*How to escape, in the end*); Their writing spreads like a black page over the face of the world, black over its black eyes (Haşurăm și colorăm. O aventură a cunoașterii). The white dot is thus the graphic representation of the world, and the black dot is the representation of one's own creation.

Another poem *On the way [to Sighisoara]* reveals another chromatic occurrence – the **black blood** - metaphor of a medieval past: *With another letter, that of light/hiding the darkness, / with a consonant - medieval object/obstructing breathing, /with the black dry blood. /The breath is the road. /The wind is the light of the night.* The black chromonym here is involved in anticipating the idea of the past of Sighisoara, in general, the road induces an introspective state, activating the most important emotions and ideas in a person, a road to Sighisoara - a place, a core of authenticity, of the root equivalent to it is a reminder of oneself, of the part of me which is related to a certain sense of kinship, of mystery, of fullness.

In conclusion, the chromatic opposition of black and white in Bogdan Ghiu's writing responds to the statement of Heraclitus from Ephesus: “What tends to separate unites from the most different tones, the most beautiful harmony is composed and everything is born from discord” (*apud.* 13, p.8).

BLACK FLORIN IARU



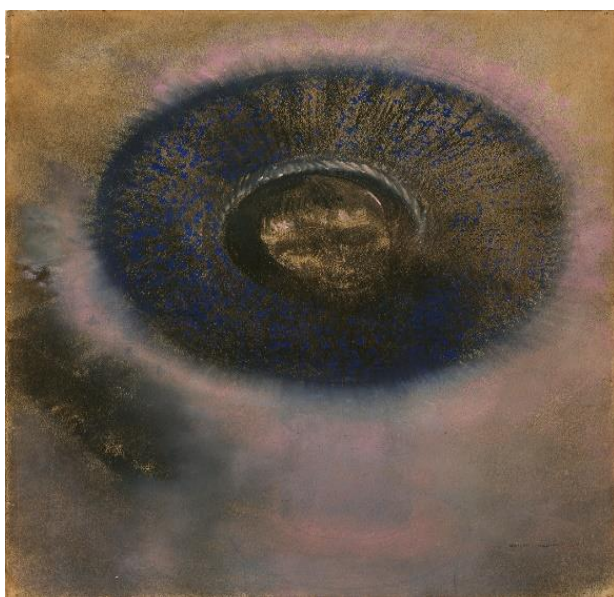
Sourcing photo:

<https://www.revistadepovestiri.ro/interviu-cu-florin-iaru/>

b. May 24, 1954

Poetry volumes:

- Songs for Crossing the Street (1981);
- Air with Diamonds (1982);
- At the Highest Fiction (1984);
- I'm going crazy and I regret it (1990);
- Selected Poems (2002);
- The Loser of Bucharest (2011);
- Stories with Changed Endings (2013);
- The Green Breasts (2017)



Odilon Redon, Head within an Aureole (about 1894-1895)

Sourcing image: <https://artvee.com/dl/head-within-an-aureole#00>

A poetic sign that admirably illustrates the idea of creation, the matrix black, fecund and fertile.

The poem *Song to Pass the Time* develops the image of a *black sea* which, in fact, is a metaphor for the uncreated, the primordial chaos pre-existing the creation of the world, outlined by playful effects: *There was a **black sea** - ah -and there was a **black**/ salty island there tra la la... We can't help but notice that this playful tra-la-la brings with it an absolutely charming flair.*

The associative networks in this poem are formed in centers emanating from the following groups of related images and words:

Black: *black sea – black cave – black woman – darkness–coffee dregs*

The Uncreated / Primordial Chaos: *black sea – darkness – damn the sea – black woman – black cave*

Life/ the pulsation of life/ creation of the world: *a salty island - my chest swelled with longing bouncing from the ribs - damned rally - soaking the sand with the blood from my body brought by the tides, in the dark, towards the upper island - let's come up like grass to green nature - in the dark, life stripped itself even more – and my heart, gloved, was pumping - Come on, heart! push atom after atom through the trombone transformed sometimes in a tuba sometimes in a trombone - a hearty pump*

Matter: *chest, ribs, sternum, head, heart, atom*

Death: *and the other - damned one slowly sang – paddles of motionless death - the upper island - climbs hurriedly to the sky - the dead sea was an unmoved gate - they were erased – to hurl to the fish*

Sea: *island–very vast waves - tide – whaleboat - clauses - ships - moving ships*

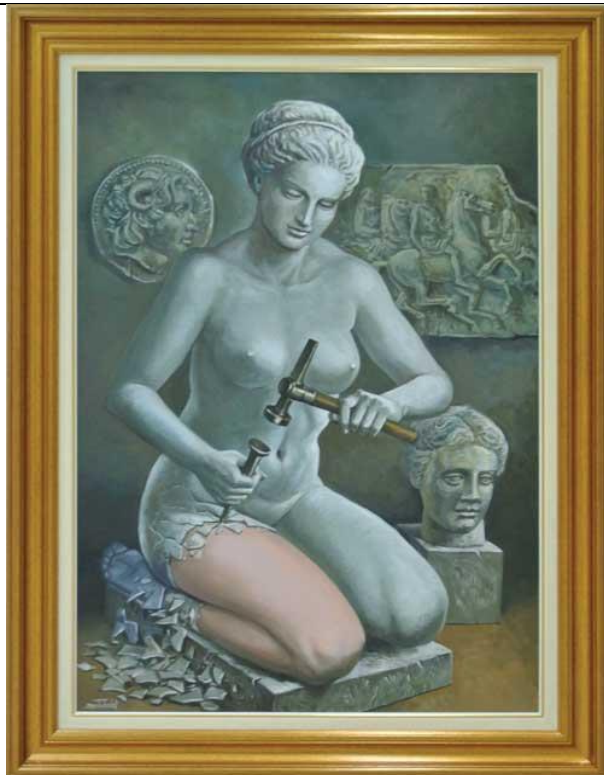
Woman: *black woman - mother*

As we can easily see, the poem presents an extremely complex and subtle associative network, organized around the following ideas: *black, eternal, matter, life, death, sea*. The resulting network outlines serious, fundamental ideas of existence rendered in a mixture of playful effects and voluptuous aggressiveness – their obsessive quality, evidenced by the overlay of the second text *La negre*. Associative networks have a serious affective charge.

The poem *La negre*, develops the image of the irreversible flow of time, in turn, generating the following associative networks:

The flow of time: *how do white-dwarfs die–how do the monstrous stars fade away - how I fell idly from 23/into 24/into 25 years ago and so on - a falling drop - the monstrous stars are fading - the century is coming*

Human diversity: *white race – black race – yellow race*



Valentin Tănase,
Cercul Militar Național | Expoziția de pictură a artistului
plastic Valentin Tănase (cmn.ro)



Valentin Tănase, Între alb și negru, Cercul Militar
Național | Expoziția de pictură a artistului plastic Valentin
Tănase (cmn.ro)

The chromatic: white – black (black: black race – black brothel – black - a flood of black)

– yellow – indigo – pink –candy-pink – maroon

The universe/everything: the universe is the insane fancy of a potato

Life: a whore lying colourfully

The downfall: whore – decadent – brothel – melancholy disease - nervous - sadness – suffer

Creation: sings - chirps - poetry - has me on a bed of paper - the reader – a flood of black

Existential routine: arms full of receipts – candy pink or maroon event background.

Psychocritical work involves the overlapping of texts and the search for obsessive elements [idem, p. 66]. Thus, the overlapping of the texts and the establishment of the associative networks reveal differences between the subject and the network, the points of coincidence reaffirming themselves in the chromatic aspect (black). In general, we must mention that associative networks structure fantasies, they are nothing more than the superficial “weave of fantasy figures” [idem, p. 108].

The associative network in the first poem is linked to an unconscious female image - the female, maternal, germinating figure of the black sea. Here the archetypal features of the myth of the Great Mother stand out - a metaphor that structures the poem and enhances the idea of creation (the transformation of primordial chaos into the cosmos). And in the second poem, the associative network juxtaposes both a latent female figure under the semblance of life, plasticized through metaphor: *Beautiful is this intensely colored whore who makes love to me on a paper bed*, and an unconscious male figure - the myth of the creator, valuing creation as an act of triumph over the passage of time and, implicitly, over death, or “Creation remains something else [...]. It affirms the absurd, the miracle of a time flowing in the opposite direction to entropic time, the positive victory over death” [idem, 233]. Ultimately, an inventory of a female network marked by an aggressive, degrading drive is coagulated.

Thus, in both poems, we witness a sometimes intense, sometimes diffuse feminine presence in an aquatic form (*black sea* - a maternal, fluid nebula) or spiritual form (*women with names of decadent poetry*). For Florin Iaru, the woman and the sea are images (avatars) of creation, or, in other words, they correspond to a feminine essence, which is considered “closest to origins, to genesis” [12, 27]. This is how the female presence is explained, in various forms, in both poems. We can say that what Ch. Mauron claimed regarding Mallarmé is also true for Florin Iaru, namely that “the female figure represents an internal object,



Aubrey Vincent Beardsley, Oriental dancer (1898)

Sourcing image: https://artchive.ru/aubreybeardsley/works/548326~Vostochnaja_tantsovschitsa



Aubrey Vincent Beardsley, Virgilius the Sorcerer (1893).

Sourcing image: <https://artvee.com/dl/virgilius-the-sorcerer#00>

therefore a part of the writer's personality" [19, p. 368].

Comparing the associative networks highlights the fact that in both poems *theblack* develops archetypal meanings (valences of matrix, germination, creation), only that in the poem *Song toPast the Time*, *black* foreshadows the idea of creation at the level of the macrocosm, and in the poem *La negre* the chromonym *black* suggests the act of creation at the microcosm level:

No no noand no
nothing else butblack

a flood of black

on the **candy pink or maroon**

event background

A conflict is projected between the creative self and the social self:

And yet

I wish I didn't suffer from the disease of melancholy

of having loved a woman with the name of decadent poetry

to have left with arms full of bills and indigo

when the century comes to me

against the candy-pink or maroon event background

In this poem, Florin Iaru mentions the so-called "forced prostitutes" à la Baudelaire: *Beautiful is this intensely colored whore who makes love to me on a paper bed*. These metaphorical structures project the equivalence creation = love. Creation/the creative act seduces through "the mixture of voluptuousness, fecundity and energy that love produces" [23, p. 64]. In the economy of human existence, the creator represents, as Florin Iaru suggests in the poem *La negre*, a distinct human variety – a *sui generis* race comparable to the white, the black or the yellow (which he not accidentally evokes in the text).

Consequently, in the analyzed texts, *black* admirably illustrates the idea of creation, the matrix black, fecund and fertile. The "*flood of black*" is "aquality" that shapes one part of the self - the creative self, the other, marked by *pink-candy or maroon events*, representing the social self, the relationship with the world/the Universe - the beloved - the reader.

CHOCOLATE SECONDARY CORE

Ion STRATAN



Photo source: <https://humanitas.ro/autori/ion-stratan>
b. October 1, 1955 – d. October 19 2005

Volumes of verses:

- *Five Songs for the Civilizing Heroes* (1983);
- *Light from the Fire* (1990);
- *Luxury* (1992);
- *The Russian Roulette* (1993);
- *The Undoing* (1994);
- *A Good Day to Die* (1995);
- *Sing, Goddess, the Wrath* (1996);
- *More than Death* (1997);
- *On the Side of the Dead* (1998);
- *The Coffee with Salt* (1998);
- *Soft Water* (1998);
- *The Verb Cross* ([2000);
- *Snow in the night* (2000);
- *A World of Words* (2001)

Chocolate – the secondary core of the chromonym black (at I. Stratan) – I. Poetic sign illustrating the aesthetics of the concept of time.

The poet outlines a key coordinate – the aspect of time that he understands and expresses artistically in the form of chocolate. Thus, in an expressive form, the time takes the “face” of chocolate, in which the sense of taste is dominant, although the chromatic allusion is also preserved, capturing the dynamics of black and the vibrations of brown. I. Stratan imagines time as a synesthetic representation, the chocolate being the syncretic core of taste, flavor, color, and shapes. In the poem *The chocolate roof*, it edifies itself into an excellent existential metaphor of a playful nature - a metaphor of time/of human existence throughout history and civilization. Beyond the classical rigor, which situates our daily bread as an expression of human existence in the plane of historical existence, the author uses a reason that evokes a non-essential product, secondary from a vital point of view, the prerogative of sufficiency, comfort, consumerism. The chocolate motif amplifies the playfulness, also induces notes of sarcasm. The essential cognitive mechanism through which the conceptual scheme of I. Stratan's poetry works is based on the frustration of the reader's expectation, who expecting to find certain semantic representations that refer to essential realities, vital for the human condition, becomes frustrated by the fact that these expectations are overturned (And we'll see how the world exists/For the dark chocolate).

The juxtaposition of chocolate, a less conventional image for the aesthetic expression of the idea of existence in time, reveals its protean poetic potential. The poet marks the stages of the evolution of human society - historical time in relation to cosmic time - through a fan of chocolate of all colours (“gustatory and visual incantations sui generis”) and consistencies.

The network of associations that emerges from the poem is as follows:

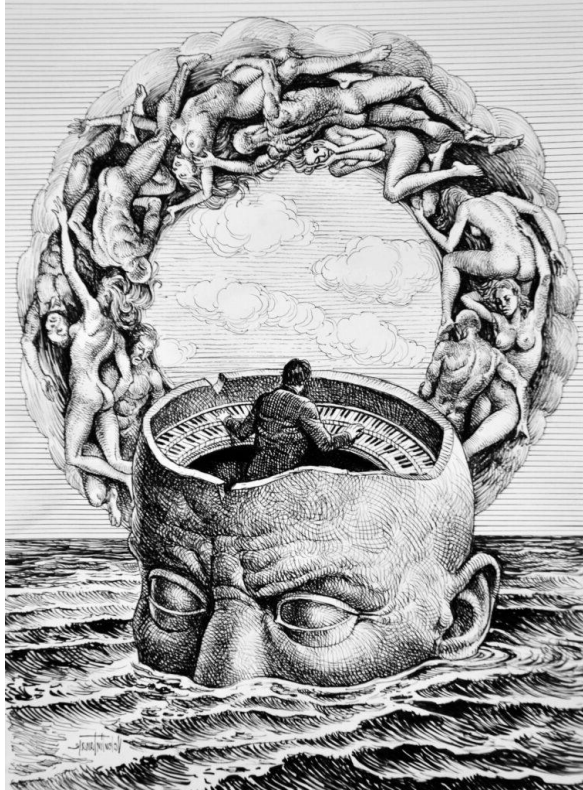
Cosmic Time/Universe: roof (the chocolate roof) – the world – stars

Existence in historical time: the black chocolate – slightly bitter chocolate–milk chocolate - Chinese chocolate – peanut chocolate – cream chocolate – a chocolate bar – marzipans -

Historical time: slavery - Middle Ages - heretics - class struggle - state taste of history - sword fighting - cannons - timeless histories

Chromatic: dark - milk chocolate – cream chocolate – chocolates

Chocolate, the gustatory and chromatic “receiver” of temporal patterns, through its varied range offers an assumption about a historical time (concrete historical epochs), which, however, allows itself to be recreated in



Valentin Năstase, *Muzica gândurilor* (2022), Expoziția Între alb și negru (2022).



Alvaro Castagnet, *Ciudad Vieja Series*
Sourcing image: <https://alvarocastagnet.net/artwork/>

the readers' minds, thus engaging them in a dialogic game of imagination with the text. *We'll go up on the chocolate roof one evening/To see if the world is long or/the world is wide-* The roof is here an expression of the permanence of cosmic time over historical time, and historical time is not outside the cosmic. The "*chocolate roof*" represents the expression of cosmic time, which encapsulates models, forms, paradigmatic, archetypal frameworks of experience, and has the value of a symbolic centre ("The centre ensures endowing any act with meaning and prestige" [2, p.17]).

The chocolate roof is, par excellence, the repository of the world, the placenta that preserves the pulsation of paradigmatic myths, of archetypes. The chocolate roof symbolically reproduces the essence of the universe. The "becoming chocolate" at the end of the poem *And as we became chocolates/In the middle of the night/ Telling timeless stories/ Beneath the ripe stars* is tantamount to an act of return/ of participation in this symbolic centre, a return to the self, to the cosmic time that guards historical time - *a sui generis recovery of the centre*. We observe that historical time, with the forms it takes, "endures" the "fractal gaze" [22, p. 14], respecting the internal principle of fractals by increasing complexity from one stage of development to another.

Chocolate → dark chocolate → slightly bitter chocolate → peanut chocolate → cream chocolate → chocolate bars (sophisticated shapes)

Historical time has a pronounced stratified, eminently fractal character. Although seemingly linear, historical time is essentially not entirely linear. A certain form of historical time (epoch) implicitly contains heterogeneous "nooks" of time. Epochs are nothing but fractal hypostases of historical time ("The world is a universe of fractals" [*apud*. 22, p. 26]).

The generative mechanism of fractal time - the multidimensional temporality of history can be illustrated as follows:

Cosmic time - the chocolate roof

Historical time - slavery –the dark chocolate;

Historical time - Middle Ages –slightly bitter chocolate (heretics) –peanut chocolate;

Historical time - Class struggle - cream chocolate

Historical time - scheme –chocolate bars;

Historical time - taste of state - Chinese chocolate

The aesthetics of the fragment, invoking the motif of the bitter chocolate is sufficient to imagine the era as a whole and its spirit, or "in such kind of aesthetics, the detail is no longer a sign of barochism, redundant mannerism, noise, etc., but subtle and essential infor-



Marc Shagall, Creation (1960)

Sourcing image:

<https://www.wikiart.org/en/marc-chagall/creation-1960>

mation” [22, p. 102]. The chocolate and its various forms contain the idea of a certain segment of historical time.

If we take the model of fractal dynamics as a premise, we identify in I. Stratan’s poem the fractal architecture of historical time - chocolate fractals. The fractal model of historical time - a fractal complex that shapes the configuration of time and the quality of existence. “The principle of fractals enters the “cosmoid of the work” (L. Blaga) in the form of themes which, on the figurative and structural level, specifically reconstruct the meaning of the work” [idem, p. 99].

The imaginary of the poem offers a post-modernist picture of the time in which the author-artist uses chocolate (dark chocolate, milk chocolate, etc.) as pencil, watercolors, etc.

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ҚАЗАҚТЫҢ СИҚЫРЛЫ СӨЗ ҮЛГІСІ

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Abstract

In the article, we determine the nature of magical songs from the early communal period. We focused on how the types of poems originating from the old faith acquired ritual significance. In the mentioned article, what kind of words the Kazakhs paid attention to, and why they gave importance to them, were reflected through badik, arbau, and witchcraft. It is said that the function of each healing poem is formed by which magical action.

Аннотация

Мақалада ертедегі қауымдық кезеңнен келе жатқан магиялық жырлардың сипатын анықтаймыз. Ескі сенімнен бастау алатын өлең түрлерінің қалай ғұрыптық мәнге ие болғандығына тоқталдық. Аталмыш мақалада қазақтың қандай сөзге тоқтағандығы, не үшін маңыз бергендігі бәдік, арбау, бақсы сарыны арқылы көрініс тапқан. Әр емдік өлеңнің қызметі қай магиялық әрекетпен құралатыны айтылады.

Keywords: first community, ritual, badik, seduction, witchcraft, faith, treatment, ritual, healing, witches.

Кілт сөздер: алғашқы қауым, ғұрып, бәдік, арбау, бақсы сарыны, сенім, ем, жоралғы, күн жайлату, бақсылар.

Қазақ халық өлеңдерінің тарихы тереңде жатыр. Ежелгі қоғам қауымы түрлі діннің сеніміне кірмей тұрып, табиғаттан тылсым күшті сезіне білген ғой. Олардың тұтқан ырымдарын, қалыптастырған ғұрыптарын ауыз әдебиетінің бастауына жатқызамыз. «Алғашқы қауымға тән дүниетаным мен діни нанымдардың қазақ фольклорындағы көрінісі болып анимизм, тотемизм, магия, табу, сондай-ақ рулық қауымның дамыған тұсында қалыптасқан шамандық түсініктер мен аруаққа табыну есептеледі». [1, 7 б.] Қазақ фольклоры сонау алғашқы қауым иелерінің тотемдік, магиялық, шамандық түсініктерінен өрнек алды. Белгілі бір сенімге сүйеніп жасалған емдік өлеңдерді фольклортанушы ғалымдар «қалып сөзі», «дінмен байланысты өлеңдер», «халықтың ескілікті наным-сенімінен туған өлеңдер» деп түрліше жіктегендері рас. Ғұрыптық фольклор саласын зерттеуші ғалым Б.Абылқасымов дін салтынан туған өлеңдердің ішінде бәдік, арбау, бақсы сарынан бөлек алады да, жарапазан мен наурыз жырын күнтізбелік сипаты жағынан ерекше екенін айтады. «Арбау, бәдік,

бақсы сарындарының басын қосатын, көгендейтін жанды байланыс та сол сөз құдыретіне деген сенімге, сөз болғанда жай сөз емес, белгілі бір ғұрыпты, рәсімді, жораны өткеру үстінде ғана айтылатын сөзге қатысты». [2, 15 б.] Көне нанымдармен астасқан ғұрып фольклоры құпияға толы болғандықтан кімді болмасын қызықтырды. Мен магиялық поэзия үлгілерінің, оның ішінде емшілікке қатысты өлеңдер сырына тоқталғым келеді.

Сөзімнен сезілгендей, адамзаттың бір тылсымға илігетіні анық еді. Ертеде қоршаған күштің алдында қауқарсыздық пен оған сөз, әрекет, ишарат, ниет арқылы әсер етуге сенім болған. Табиғатты жіті танымағандар әр аурудың иесі, құдайы болатындығына шүбә келтірмеді. Бәдік өлеңдер арқылы аурудан құтылуға әрекет жасайды. «Адам ауырса, яки мал ауырса, әйел-еркек жиналып, ауырған малды қамап алып, екі-екіден қосылып, шулап өлең айтады. Өлең айтқанда ауру «иесін» қорқытып, жын ойнағандай қылып айтады» [3, 177 б.] деген сөздердің бәдікке қатысы бары шын. Қазақ ғалымдары бәдік арқылы адамды,

малды емдеп, у қайтарғандығын нақтылайды. Ал түркі жұртшылығы бәдіктің ауру атауы, оған қатысты ғұрып әрі мәтіні екендігін айғақтаған. Бәдіктің этимологиясына байланысты нақты деректер жоқтың қасы. Өзбек ғалымы Б.Сарымсаков оны «бәзік» сөзімен ұқсастырады. «Бәзіктен» «безгек» сөзін шығарады. Алайда қалтырау, дірілдеудің бар ауруға тән екендігі, ал бәдіктің оған аз қатысы болатындығы да зерттелген. Бұл сөз өзге түркі халықтарындағы «гулапшон», «бадхон» ұғымдарымен ағайындас. Яғни бәдікті емдеу, қаскөй күштен арылу үшін сөзден медет тілеу өзге туыстас халықтардың да тарихында сақталған. Емшілікке қатысты аурудың иесінен құтылуға бәдік айтылады дедік. Осы бәдіктің нендей қасиеті бар екендігі, адамдардың санасына қандай құдіреті әсер етіп тұрғандығы, әрине, таңғалдырарлық. Негізінде бәдікті бір шайтан не жын ретінде бейнелейді де, одан құтылуға тырысады. Өлеңнің мәтінінде бәдікті жанды, ия жансыз нәрсеге көшіреді («бәдік кетіп барады кең жазықта, бәдік кетіп барады мекесіне, бәдік кетіп барады бұлағына»). «Кейінгі кезеңдерде індет, адамға мерез, пес аурулары келсе, қыз-бозбала қыр басына жиналып түні бойы өлең айтқан. Оны «көшіру» деп атаған». [4, 57 б.] Мәтін ішінде бәдікке күш көрсету («бәдікті құдай ондап қолға берсе, келместей ғып бір ағашқа таңайықта»), өтініш білдіру («таппасаң көшер жерді мен айтайын», «ежелгідей тілімді алсаң бәдік»), мүлде көзін құрту («бәдікті құдай ондап қолға берсе, тебелеп өлтірейік бәдікті біз») сияқты ниеттер аңғарылады. Бұл жанрда ең көп қайталанатын «бәдік», «көш» деген сөздері өзгермейтін қағида. Бір айтқанды сан рет қайталауда жалықтырушылық болғанымен, ол магиялық әрекеттің өзгермес ережесі. Халықтың зор сенімі де бір сөзді, сөз тіркесін ұдайы айта беру арқылы зиянкеске соғұрлым әсер ете алатындығында жатыр. Бәдіктің жалаң мәтіні ауруға қарсы тұруға жарамсыз. Оған қоса орындалатын әрекеті маңыздылыққа ие. Бәдік атқаруда ауырған адам, яки малды әйелдер ортаға алып, өлеңдетіп, шуылдатып, тарсыл-гүрсілмен қуып шығатын болған. Кейде ауыл жастары жиналып, жартылай ойын-сауыққа құрылатын, залым күшті жоюға арналған бәдік өткеру салты болған. Ендігі бір деректерде оның «бәдікхан», яғни тікелей сайланған тұлға арқылы орындалғандығы айтылды. Бірінші мәселе бойынша өлеңді тек қана қыздардың айтуы матриархат заманымен байланыстырылады. Ә.Диваевтың зерттеулерінде бәдікке ауыл адамдары түгел қатысып, кезектесіп өлеңдеткен. Ал Б.Сарымсаков өзбектерде ғұрып орындауда бәдікханның қолына жеті тал шыбық алып, ауруды жеңіл сабалап отыратындығын көрсетеді. Салт орындауда бізде айырмашылықтар бары байқалады. Қазақ халқында бәдіктің барлық жоралғылары тұтастай жиынға қатысушылар арқылы істелген. Осы жерде бәдікті айтысқа ұқсатып, шатасулар да орын алмады емес. Бәдіктің кейбір тұстары диалогқа құрылатындығына қарап, айтыстың бір түріне жатқызған қате пікірлер бар.

Бұл тұрғыда ғалым Б.Абылқасымов бәдіктің айтыспен қайнаспайтындығын, өз алдына бөлек жанр екендігінің басын ашықтайды. Бәдікте қыз бен жігіттің кезектесіп айтатын мәтін жолдары кезігеді, дегенмен, ол мәтінді бір адам орындаса да мазмұны айтарлықтай өзгермейді. Сондықтан бәдікті жарысқа, айтысу өнеріне, өнерпаздық орындауға құрылмағандықтан айтыстан арашалай алады екенбіз.

Арбаудың шығу тегі дұға, дуамен байланыстырылады. Оның мәтінінде пайғамбар есімдерінің мол ұшырасып отыруының өзі осыдан шықса керек. «Шықсын деп Мұса келді,

Мұса тілін алмасаң,

Дайыр тақсыр пайғамбардың өзі келді». [2, 59 б.]

Дұғада жаратқаннан жәрдем тілесе, арбауда өлең сөзбен қоса белгілі әрекет біріккен түрінде ғұрып орындалады («көкше» деген аурудан арылу үшін арбаушы алақандарын бір-біріне шапалақтан соғып отырады). «Қайсақтарда арбау дуаның артықшылғына қарай аталады, ал арбаушы – дуаның көмегімен адамды сиқырдан, кеселден, тағы сол сияқтылардан айықтыратын қабілетке ие адамдар» [5, 65 б.] деген пікір сөзімізді қуаттайды. Қарап отырғандай, арбаудың өзіне сайланған арбаушысы болады. Жанр ретінде жіліктенуіне қатысты көзқарастар баршылық. Соның ішінде Ш. Уәлиханов зерттеулеріндегі ой негізгі басшылыққа алынып жүр. Өйткені кей жерлерде арбау қасиеті тек улы жәндіктерден қорғанатын рәсім ретінде атап көрсетілген. Арбауды жәндік шаққанға, көз тиюге, түрлі аурудан сақтануға орай айтатын. Бұндай анықтама А.Байтұрсынұлының «Құрт шақыруды» қосқан қалып сөздерінен және Ә.Марғұланның халық аузынан жазып алған «Құрт шақырғанда айтатын сөз» деген мәтінінен шығып отыр. Яғни «құрт шақыру» дегеніміз тіс еміне айтылды. Арбауды жанды құран сөздер, қасиетті есімдер арқылы сескендіруге, шөп атауларымен қорқытуға, мал аттарымен шошытуға, түсініксіз сөздермен адастыруға тырысады. Басты рөлді түсініксіз көп сөздер атқарады. Ұғымы байланыспайтын қаптаған атауларды естіген ауру иесінің есімі табылып қалып, жеңіліске ұшырауы мүмкін. Арбаушының болатындығын, оның шеберлігі де маңызды екенін айтып өттік. Ол қандай әрекеттерді орындайды деген сауал тууы мүмкін. Магиялық әрекетке негізделген емшілердің амалдары зиян күшті жоюға тікелей жауапты. Мысалы «Аманқарағай болысындағы тәуіптер емі: бір тұтам мақтаға ешкі майын тамызып, меңдуана себеді де оны 1/4 аршын ұзындығындай шыбыққа орайды, сосын су құйылған тостағанның дәл ортасына ине қадайды, оның ұшына мақта оралған шыбақ кіргізеді. Нәтижесінде

қуыршаққа ұқсаған бірдеңе пайда болады. Оны тұтатады. Тісі ауырған сырқаттың үстіне ақ шүберек жауып, аузын аштырады да әлгі қуыршақтың үстіне тұрғызады.

Сөйтіп, тәуіп мына арбауды бірнеше рет қайталайды:

Арқадағы алты құрт,

Арқаласып келер құрт.
Желкедегі жеті құрт,
Желкелесіп келер құрт.
Азудағы алты құрт,
Азуласып келер құрт.
Басар, басар, ка, ка, ка!
Басып келер, ка, ка, ка!» [2, 65 б.]

Б.Абылқасымов бұлт шақыру мен жаңбыр шақыруды арбау өлеңдерінің қатарына кіріктіреді. «Ауа райына әмір беріледі» деген ескі түсініктен шыққан ой ұшығы өлеңмен қабысып, жел шақыру жайшылар мен қалың қауым арқылы атқарылған. Автор бұл өлеңдерде «жалбарыну» мотиві басым болғанымен, арбау өлеңдерде де оның көрініс беретіндігін айтып, бөлек қарастырмауды жөн санайды. Егіншілікпен тұрмыс кешкен дүниежүзі халықтарының нанымында тәңіріден тамшы тілеу кең етек алған. Тиісінше әр ұлттың жауынға қауышу үшін атқаратын істері болды. Қазақтың жауын шақыру ғұрпы тасаттық беру және жай тасы арқылы орындалады. Екі ғұрыптың да өзге ұлт өкілдерінде өткізілуі түрлі болғанымен, көздейтіні бір нәрсе. Бұлт шақырып, тіршілікке нәр сұраудың арғы тегі магиялық түсініктен шығып тұр. «Тасаддук» сөзі – Алланың ризалығын алу мақсатында садақа жасау ұғымын береді. Қазақ халқында тасаттыққа барлық ауыл адамдары қатысады, құдіретті күш иесін разы ету үшін міндетті түрде құрбандыққа мал шалынады. Оның еті қасиетті саналып, таратылады, түгел дәм татылады. Салт өзен, көл, әйтеуір сулы жерге жақын өткізілген. Сонымен қатар бұлт шақыруға жай тасы керек құрал. Аталмыш тасты суға батырады не су себеді де, арбау оқылады. Қазақтарда тасты қанға малу, құрбандық мал қанын суға ағызу жоралғылары бар. Жаңбыр шақыруда темір сөзін қолдану қалыпты құбылыс. Темір мұздай болғасын, суықтық шақырады әрі найзағай тартқыштығына қарап өлең мәтінінен орын алған дей аламыз. Күн жайлату өлеңдерінің денінде су патшасы Сүлеймен, қара, бұлт, темір, тас, мұз, жау, жаңбыр сөздерінің қайталанулары жиі. Ал қайталаулар – магиялық ғұрыпты орындаудың қағидасы.

«Қара қожам атқа мін,
Жаңбыр менен желді айда.
...Қолдан қара жауын бер,

Қара сабам қаусады». [2, 78 б.] деген өлең жолдарында «қара» сөзінің көп ұшырасуын, бұлтты қара түске ұқсастырудан шыққандығын байқаймыз.

Емшілікке қатысты өлеңдер ішіне бақсы сарынын қосамыз. Алдымен бақсы дегеніміздің қайдан келіп, қандай мағына беретіндігін, кім екендігіне тоқталған жөн сияқты. «Бақсылар сал, сары ауру кеселдерін емдегенде өздерін сары жирен атқа мінген, барлық киелі күштердің тілін білетін адамдар ретінде ұстаған». [4, 59 б.] Қазақ ішінде бақсылық туралы деректер XVIII ғасырдан жетті. Бақсы балшы, жауырыншы, ырымшы, сиқыршы, жадагер ұғымдарымен қиыстырылды. Олар құрбандыққа мал бағыштап, сиқырға толы сөздерін айтқан. Өзге халықтарда бақсылар жауын шақырып, қар борататын болса, қазақтарда оны

бақсы емес, жадагер орындайды. Дегенмен, бізде де құйын соққызып, жел шақыратын бақсылар болғандығы рас. Ертеректе бақсылардың арнайы киімдері, қолдарында даңғыра, дабыл, домбыра, қобыз, асатаяқтары болса, кейін келе біртіндеп қарабайырланған. Қазақ бақсылары киім киіс жағынан басқа қазақ адамынан еш дараланбайтын. Әдетте, алба-жұлба шапандар кию өзге жұрттың бақсыларына тән деседі. Қазақта олар көбінше ақ бөзден тігілген ақ көйлек киген, сырт бейнелері айналасына үрей ұялатпаған. Негұрлым көне кездерде бақсылар соғұрлым күшке ие болған дейміз. Бақсылардың ырыми функциясы болжағыштығымен әлеуметтік рөлдері артқан. Тіпті ел басына күн туғанда, жаудың бетін қайтарып, дұшпанның аяқалысын білуге де осы кісілер ықпалды. Алайда, болжаулар үнемі дәл түспегесін, әскери магия тарих сахнасынан ысырыла бастайды. Бүгінде шоқтық өнердің балгерлік, тәуіптік түрлері сақталғаны анық. Тәннен зиянкесті айдап шығуда бақсылар емшілік қызметті орындайды, бұл әлі күнге дейін өзектілікке ие. Салқар көштен жеткен балгерлік, емшілік, тәуіптік дарыған талант иелері көпшілікке өзін паш ететін, осы ерекшелігіне орай синкреттік өнерге жатқызылады. Ауруды емдегенде олар сиқыршылық әрі гипноздық әрекетке барады. Көзбайлаушылықты керемет меңгеру бір жағынан қан арқылы жетсе, екінші жағынан үйрену, сабақ алу, машықтанумен жасалған екен. Біріншісінде аруақтармен байланысу, жындармен тілдесу атадан балаға қалады-мыс. Ұрпақтан-ұрпаққа тараған бақсылық қазақ ішінде өте көп. Бала бұл өнерге құлқы болсын, болмасын ата жолын ұстануға міндет саналған. Әйтпегенде, аруақ қысып, сөз алмағанда өмірмен қош айтысуы ғажап емес. Екіншісіне келсек, бақсылықтың қолдан үйренуге көнетіндігі. Білгір бақсыдан дәріс алып, шәкірті атанады, көмекшісі болады, ақырында өнерді меңгеріп шығады. Сонда қарап отырсақ, жын шақырудың өзі ниет, еңбек, тәжірибемен даритындығы, бақсылардың ойын кезінде көрсететін қимылдары (зарлы сарын айту, жынға жыр арнау, есін жоғалту, ауыздан көбік ату, қисыныс сөйлеу) дайындықтың бір бөлшегі саналатындығы шын екен. Осыған қарамастан, бақсының атқаратын негізгі функциясы – ем жасау. Бұл ғұрыпты өткеруде түрлі ойын түрі және бақсы сарыны айтылады. Бақсылар сөзін пірлерге сиындан бастайды. Кейін кезегімен аруақтарды, өз ата-бабасының, танымал бақсылардың аруағын шақырады. Үшкіру, қағу, көшіру сияқты магиялық емді жүзеге асырып, соңында жын қайтарады.

«Қарамұрт ата, әулие,
Бекбау ата, бек ата,
Бегіш ата қолдай гөр.
Шақпақ ата, әулие,
Қошқар ата, әулие,
Сіздерден медет тілеймін». [2, 129 б.]

Бақсы аурудың шығу белгілеріне сөз жеткізу үшін мейірімді жындарына «дұрысын айт», «ақиқатын көрсет» сықылды сөз тіркестерін үнемі қайталайды. Бақсының сырт көзге тұрпайы,

түсініксіз қимылдар жасауы – жындармен айқасып жатқандығының хабары. Артынан аурудың айығып, айықпасын жұртшылыққа жария кылады. Осылайша емделушіге екінші жан бітіреді не зиянды жыннан сақтап қала алмайды.

Бәдік, арбау, бақсы сарыны ғұрыптарының орындалуында адамзаттың көкейінде ең қасиеттісі алдымен сенім тұрады. Артынша амал мен сөздің құдыретін дарыта отырып зиянкестен арылуға ұмтылған. Көне наным-сенімнен туған сиқырлы өлеңдер халықтың жебеуші күшіне айнала білген.

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PHYSICAL SCIENCES

OPTICAL ABSORPTION EDGE OF $\text{TlIn}_{1-x}\text{Yb}_x\text{S}_2$ SINGLE CRYSTALS AND THE EFFECT OF ELECTRON IRRADIATION ON THEIR BANDGAP

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КРАЙ ОПТИЧЕСКОГО ПОГЛОЩЕНИЯ МОНОКРИСТАЛЛОВ $\text{TlIn}_{1-x}\text{Yb}_x\text{S}_2$ И ВЛИЯНИЕ ЭЛЕКТРОННОГО ОБЛУЧЕНИЯ НА ШИРИНУ ИХ ЗАПРЕЩЕННОЙ ЗОНЫ

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Abstract

The effect of partial substitution of indium atoms by ytterbium atoms (0.5 and 1 mol%) on the band gap of TlInS_2 single crystals irradiated with electrons with an energy of 2 MeV and a fluence of up to $1 \cdot 10^{16}$ el/cm² has been studied. The band gap from the measured absorption spectra at room temperature was determined using the Tauc method. It was found that electron irradiation leads to a decrease in the band gap in all $\text{TlIn}_{1-x}\text{Yb}_x\text{S}_2$ crystals studied. In the range of 77–200 K, the temperature dependence of the exciton absorption band in TlInS_2 and $\text{TlIn}_{0.995}\text{Yb}_{0.005}\text{S}_2$ single crystals was studied.

Аннотация

Исследовано влияние частичного замещения атомов индия атомами иттербия (0,5 и 1 мол%) на ширину запрещенной зоны монокристаллов TlInS_2 , облученных электронами с энергией 2 МэВ и флюенсом до $1 \cdot 10^{16}$ эл/см². Ширина запрещенной зоны из измеренных спектров поглощения при комнатной температуре определена по методике Тауца. Установлено, что электронное облучение приводит к уменьшению ширины запрещенной зоны во всех исследованных кристаллах $\text{TlIn}_{1-x}\text{Yb}_x\text{S}_2$. В диапазоне 77–200 К изучена температурная зависимость экситонной полосы поглощения в монокристаллах TlInS_2 и $\text{TlIn}_{0.995}\text{Yb}_{0.005}\text{S}_2$.

Keywords: semiconductor, rare earth element, exciton, band gap, electron irradiation.

Ключевые слова: полупроводник, редкоземельный элемент, экситон, ширина запрещенной зоны, электронное облучение.

Введение

Последнее время проводится интенсивный поиск новых сложных полупроводниковых материалов, в составе которых частичная замена одного или нескольких элементов позволили бы модифицировать и управлять их характеристиками и свойствами [1]. Монокристалл TlInS_2 является одним из таких многокомпонентных широкозонных полупроводников, в которых можно заменить часть атомов индия другими атомами (например, иттербием) [2]. Возможность изменения состава полупроводника TlInS_2 позволяет регулировать его электрофизические, фотоэлектрические, оптические и другие свойства. Одной из важных характеристик полупроводника является ширина запрещенной зоны E_g , которая может меняться из-за наличия примесей и дефектов структуры, а также из-за внешних воздействий (температура, давление, облучение, деформация).

Край оптического поглощения TlInS_2 исследован, например, в [3] и при комнатной температуре установлено сосуществование непрямых E_{gi} и прямых E_{gd} переходов ($E_{gi} = 2,29$ эВ, $E_{gd} = 2,32$ эВ), а также их изменение после гамма-облучения дозой $D = 25$ Мрад ($E_{gi} = 2,32$ эВ, $E_{gd} = 2,38$ эВ). В [4] исследованы спектральные и оптические параметры монокристаллов TlInS_2 с помощью спектрофотометрических измерений коэффициентов пропускания и отражения в диапазоне длин волн 200–2500 нм и для прямой и непрямой запрещенной зоны получены, соответственно, значения 2,340 и 2,258 эВ.

В [5] показано, что в TlInS_2 и твердых растворах $\text{TlIn}_{1-x}\text{Cr}_x\text{S}_2$ E_g уменьшается с увеличением температуры от 77 до 290 К, а замещение части атомов индия атомами хрома в пределах его растворимости также приводит к уменьшению E_g .

При изготовлении приборов, использующих светочувствительность TlInS_2 , имеются трудности в связи с наличием большого количества примесей и неконтролируемых собственных дефектов различного типа. Поэтому изучение влияния таких дефектов, в том числе полученных в результате радиационного облучения, на физические свойства TlInS_2 имеет большой практический интерес. На примере этого материала возможно также изучить зависимость влияния электронного облучения на свойства полупроводниковых твердых растворов со сложным составом.

На основе изучения фазовых диаграмм и структурных данных [6–9] для исследования влияния облучения на свойства кристаллов нами выбраны наряду с TlInS_2 также однофазные соединения $\text{TlIn}_{1-x}\text{Yb}_x\text{S}_2$ [2]. Анализ публикаций [3,4,10] позволил принять решение облучать образцы электронами с энергией 2 МэВ.

Цель настоящей работы – исследование влияния электронного облучения на ширину запрещенной зоны E_g кристаллов TlInS_2 и $\text{TlIn}_{1-x}\text{Yb}_x\text{S}_2$, и изучение температурной зависимости края оптического поглощения в них.

Экспериментальные методы

Исследованные монокристаллы полупроводниковых соединений TlInS_2 и $\text{TlIn}_{1-x}\text{Yb}_x\text{S}_2$ синтезировали путем прямого сплавления компонентов, взятых в стехиометрическом соотношении, затем выращивали методом Бриджмена-Стокбаргера. Образцы скалывали от монокристаллического слитка, их примерные размеры были $8 \times 5 \times 1$ мм³.

Для определения E_g были исследованы спектры оптического поглощения выращенных монокристаллов до и после облучения быстрыми электронами. Облучение образцов осуществлялось на ускорителе “Электроника У-003” электронами с энергией 2 МэВ и плотностью тока пучка 0,375 мкА/см². Энергия электронов была выбрана исходя из плотности и толщины образца и определялась с использованием стандартного измерительного клина (P4701) Riso 2 Piece Aluminum (Бельгия) из алюминия. Образец устанавливали перпендикулярно направлению пучка электронов на расстоянии 0,4 м от развертки ускорителя и проводили облучение до флюенса электронов 1×10^{16} эл/см². Относительная погрешность определения плотности потока ускоренных электронов составляла не более 10%. Для предотвращения повышения температуры образца под действием радиации использовался вентилятор.

Спектры оптического поглощения при комнатной температуре снимались на спектрофотометре «Лямбда 35» (Перкин Элмер) в диапазоне длин волн 190–1100 нм, относительная погрешность измерений составляла 1 Å. При этом свет направлялся на образцы перпендикулярно слоям (параллельно кристаллографической оси *c*). E_g определяли по методике Тауца [11], экстраполяцией прямолинейных участков графиков зависимости $(\alpha h\nu)^2$ к оси энергий (α – коэффициент оптического поглощения).

Низкотемпературные исследования спектров оптического поглощения слоистых полупроводниковых кристаллов $\text{TlIn}_{1-x}\text{Yb}_x\text{S}_2$ проводились при помощи установки на основе двойного монохроматора МДР-6М и криостата «УТРЕКС» с автоматической стабилизацией температуры (точность стабилизации $\pm 0,01$ К). В качестве приемника излучения служил ФЭУ-100. Разрешение установки было не хуже 2 Å. Образцы для измерений скалывались от монокристаллического слитка и имели форму тонких пластинок с толщиной от 20 до 80 мкм. Свет направлялся на образцы перпендикулярно слоям.

Результаты и их обсуждение

Спектры поглощения монокристаллов $\text{TlIn}_{1-x}\text{Yb}_x\text{S}_2$ ($x = 0,005$ и $0,01$), из которых были найдены значения E_g при различных значениях флюенсов предварительного электронного облучения, представлены на рис. 1–4.

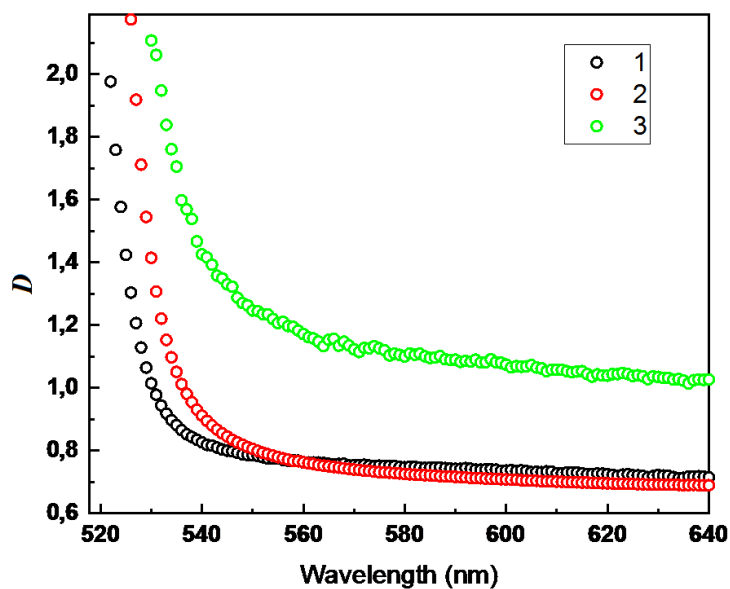


Рис. 1. Спектр поглощения монокристалла $TlIn_{0.995}Yb_{0.005}S_2$ при различных флюенсах, электрон/см²: 1) исходный, 2) $5 \cdot 10^{15}$, 3) $1 \cdot 10^{16}$.

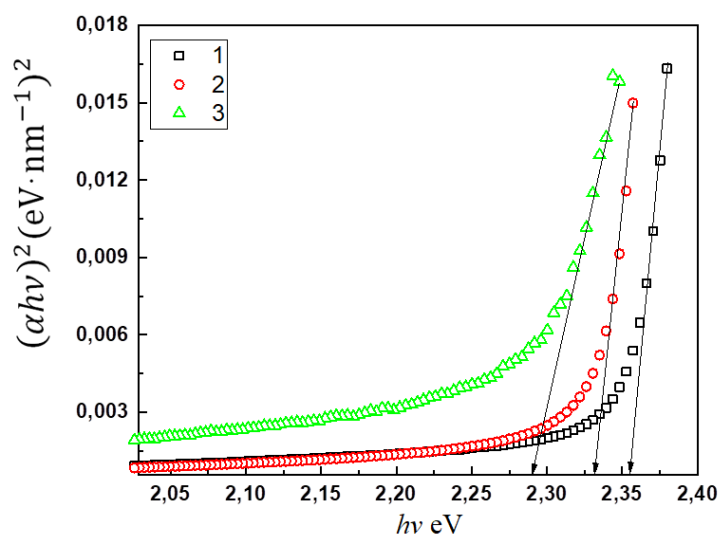


Рис. 2. Оптическая ширина запрещенной зоны монокристалла $TlIn_{0.995}Yb_{0.005}S_2$ в зависимости от энергии фотонов при различных флюенсах, электрон/см²: 1) исходный, 2) $5 \cdot 10^{15}$, 3) $1 \cdot 10^{16}$. $E_{g1}=2,358$ эВ, $E_{g2}=2,33$ эВ, $E_{g3}=2,29$ эВ.

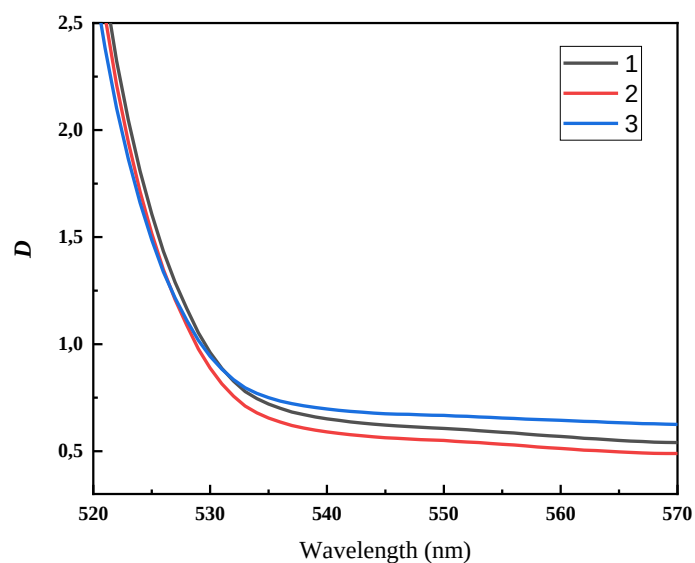


Рис. 3. Спектр поглощения монокристалла $TlIn_{0.99}Yb_{0.01}S_2$ при различных флюенсах, электрон/см²: 1) исходный, 2) $5 \cdot 10^{15}$, 3) $1 \cdot 10^{16}$.

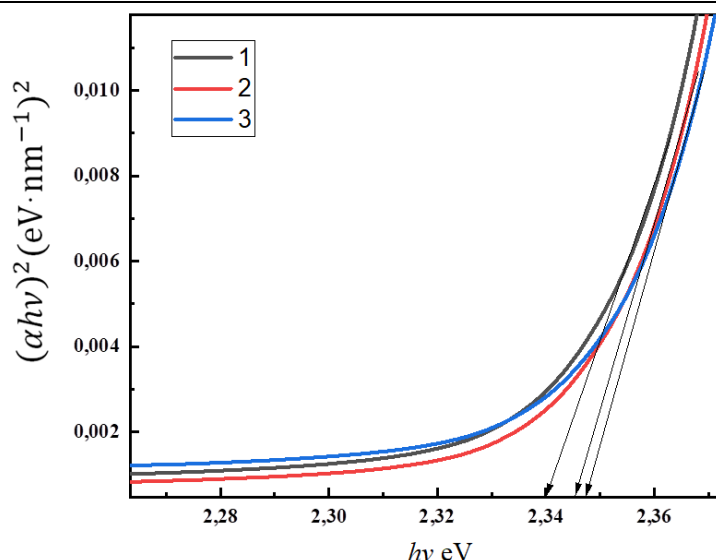


Рис. 4. Оптическая ширина запрещенной зоны монокристалла $\text{TlIn}_{0.99}\text{Yb}_{0.01}\text{S}_2$ в зависимости от энергии фотонов при различных флюенсах, электрон/см²: 1) исходный, 2) 5×10^{15} , 3) 1×10^{16} . $E_{g1}=2.340$ эВ, $E_{g2}=2.345$ эВ, $E_{g3}=2.347$ эВ.

В твердом растворе $\text{TlIn}_{1-x}\text{Yb}_x\text{S}_2$ часть атомов индия с ионным радиусом $r_u = 0,81 \text{ \AA}$ в кристалле TlInS_2 замещена атомами иттербия ($r_u = 0,92 \text{ \AA}$) [12], в результате чего параметр решетки должен увеличиваться.

Согласно расчетам зонной структуры, уменьшение расстояния между слоями должно вести к уменьшению E_g из-за расщепления потолка валентной зоны и дна зоны проводимости, а сжатие отдельных слоев ведет к росту E_g . Когда матричный кристаллообразующий атом в кристалле замещается атомом, имеющим больший атомный размер, межатомное расстояние увеличивается, и E_g кристалла уменьшается. Поэтому увеличение расстояния между атомами внутри слоя в нашем случае должно приводить к уменьшению E_g , что мы и наблюдаем на эксперименте, от 2,363 эВ (в TlInS_2) до 2,340 эВ (в $\text{TlIn}_{0.99}\text{Yb}_{0.01}\text{S}_2$). Облучение быстрыми электронами вызывает уменьшение E_g , например, в $\text{TlIn}_{0.995}\text{Yb}_{0.005}\text{S}_2$ от 2,358 эВ до 2,290 эВ (рис. 2).

Уменьшение E_g в результате электронного облучения объясняется увеличением размера приповерхностных кристаллитов, то есть при воздействии быстрых электронов постоянная решетки изменяется, вызывая релаксацию остаточного напряжения. Напряжения возникают из-за наличия

вакансий и межузельных атомов [13]. Известно, что вакансии нарушают баланс притяжения и отталкивания между соседними плоскостями кристалла, что приводит к возникновению растягивающих напряжений. Поскольку постоянная решетки связана с однородной деформацией и напряжением вдоль определенной оси, преобладающая деформация растяжения увеличивает размер зерна с увеличением флюенса быстрых электронов.

В кристаллах $p\text{-TlInS}_2$ при облучении быстрыми электронами происходят процессы увеличения степени компенсации, а с ростом флюенса - упорядочение исходных неоднородных кристаллов вследствие «радиационного легирования».

В диапазоне температур 77–300 К исследован край оптического поглощения монокристаллов $\text{TlIn}_{0.995}\text{Yb}_{0.005}\text{S}_2$. Эксперимент показал, что с уменьшением температуры край поглощения сдвигается в сторону высоких энергий, а вблизи края собственного поглощения в температурном интервале 77–200 К наблюдается полоса поглощения, связанная с электронными переходами в прямое экситонное состояние. Определены энергии экситонных пиков при разных температурах, на основании чего рассчитан температурный коэффициент сдвига экситона в интервале 77–200 К. Он имеет отрицательный знак, как и для TlInS_2 .

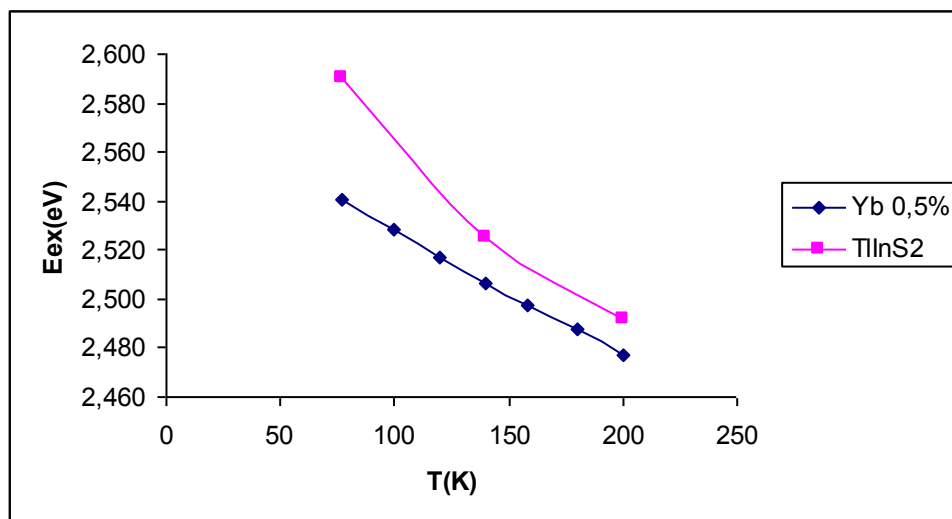


Рис. 5. Температурная зависимость энергетического положения максимума экситонной полосы поглощения в монокристаллах $TlInS_2$ и $TlIn_{0,995}Yb_{0,005}S_2$.

На рис. 5 приведена температурная зависимость максимума экситонной полосы поглощения в спектре монокристалла $TlIn_{0,995}Yb_{0,005}S_2$. Для сравнения здесь же приведена зависимость $E^{эк}(T)$ для $TlInS_2$. В результате частичного замещения ионов индия в $TlInS_2$ ионами иттербия коэффициент температурного сдвига этого экситонного пика меняется, например, в интервале 77–200 К для $TlInS_2$ $dE^{эк}/dT = -5,1 \cdot 10^{-4}$ эВ/К, а для состава $TlIn_{0,995}Yb_{0,005}S_2$ $dE^{эк}/dT = -2,0 \cdot 10^{-4}$ эВ/К, т. е. существенно меньше.

Уменьшение ширины запрещенной зоны у соединения $TlIn_{0,995}Yb_{0,005}S_2$ по отношению к $TlInS_2$ при температуре 77 К составляет 50 мэВ, для $TlInS_2$ $E^{эк} = 2,590$ эВ, а для $TlIn_{0,995}Yb_{0,005}S_2$ – 2,540 эВ, т. е. если считать, что энергия связи экситона с температурой меняется незначительно, то замещение 0,5% атомов индия атомами редкоземельного элемента иттербия заметно уменьшает ширину запрещенной зоны монокристалла $TlInS_2$. Надо отметить также, что величина коэффициента поглощения в $TlIn_{0,995}Yb_{0,005}S_2$ выше, чем в $TlInS_2$.

Заключение

Проведенные эксперименты позволили сделать вывод, что замещение части атомов индия атомами редкоземельного элемента иттербия способствует уменьшению ширины прямой запрещенной зоны в $TlInS_2$. При этом температурный коэффициент экситонного пика для состава $TlIn_{0,995}Yb_{0,005}S_2$ в диапазоне температур 77–200 К существенно уменьшается по сравнению с исходным $TlInS_2$.

Установлено, что облучение электронами энергией 2 МэВ и флюенсом до $1 \cdot 10^{16}$ эл/см² приводит к уменьшению E_g кристаллов $TlInS_2$ и $TlIn_{1-x}Yb_xS_2$.

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PEIERLS BARRIER - NABARRO AND MIGRATION MONOVACANCIES AND MULTIVACANCIES IN GRAPHENE

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Abstract

In the article, we compare a graphene monolayer with the Peierls–Nabarro barrier, which is equal to the force of interatomic interaction. This barrier is calculated from the formation energy of monovacancies, divacancies and other structural defects and the length of the newly formed carbon bond. It is shown that the Peierls–Nabarro barrier is maximum for a monovacancy and then decreases for complex defects.

Keywords: graphene, monolayer, monovacancy, divacancy, defect, carbon, barrier, dislocation.

Introduction

Defects and impurities have a significant impact on the mechanical, electrical, optical and other properties of solids, and, in particular, graphene, discovered at the beginning of the 21st century [1]. Graphene has two types of defects: (i) natural defects known as intrinsic defects in graphene, such as Stone–Wells defects, single vacancy defects, multiple defects, linear defects, and carbon adatoms; and (ii) physically introduced defects, known as extrinsic defects in graphene, which are foreign adatoms and foreign impurities [2-4].

In this article, we will consider the effect of monovacancies and multivacancies on the physical properties of graphene. Then we compare the energy of their formation and migration with the Peierls–Nabarro barrier in graphene.

Monovacancy in graphene

A monovacancy (SV) or Schottky defect is the absence of an atom or ion at a site in a crystal lattice. A monovacancy (SV) was experimentally observed in graphene in [4-7] and its image is shown in Figure 1.

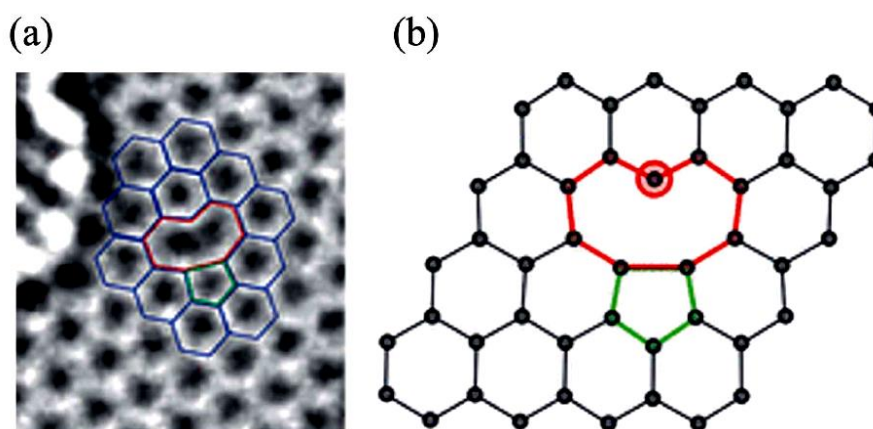


Figure 1. Monovacancy in graphene: experimental TEM image (a); atomic structure obtained as a result of calculations using the DFT method (b) [4].

Calculations have shown that the local threefold symmetry of graphene D_{3h} is broken to the C_{2v} symmetry due to the Jahn-Teller distortion [8-11]. A monovacancy has a 5/9 structure, where a new bond with length b_{CV} arises between a pair of three atoms with dangling bonds, forming a pentagon with a displacement d_{CV} of the third atom from the graphene plane [2, 12-14]. This moment is depicted in Figure 2. The energy of formation of monovacancies is $E_{CV} = 7.6-7.9$ eV and the length of the newly formed bond is $b_{CV} =$

$0.18 - 0.2$ nm, the migration barrier is $\Delta E_{CV} = 1.3$ eV at $100 - 200$ °C and out-of-plane movement $d_{CV} = 0.018$ nm [4, 8-10]. If we take the average values of E_{CV} , ΔE_{CV} and energy converted into joules, we get $E_{CV} = 12.4 \cdot 10^{-19}$ N/m, $\Delta E_{CV} = 2.1 \cdot 10^{-19}$ J = $2.1 \cdot 10^{-19}$ N/m. The force of formation of monovacancies is equal to $F_{CV} = E_{CV}/b_{CV} = 12.4 \cdot 10^{-19}$ N/m/ $1.9 \cdot 10^{-10}$ m = $6.5 \cdot 10^{-9}$ N, The force of movement of the migration barrier is equal to $\Delta F_{CV} = \Delta E_{CV}/d_{CV} = 2.1 \cdot 10^{-19}$ N/m/ $0.18 \cdot 10^{-10}$ m = $11.7 \cdot 10^{-9}$ N.

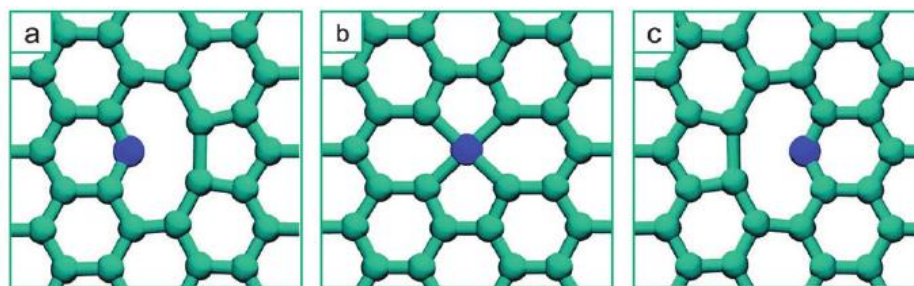


Figure 2. Initial ground state (a), transition state (b) and final ground state (c) for one step of migration of a reconstructed 5/9 monovacancy into graphene [2].

Divacancy in graphene

A double vacancy (DV) means either the fusion of two single vacancies (SV) or the removal of two adjacent carbon atoms. The DV can be reconstructed to produce two pentagons and one octagon, indicated by the 5-8-5 defect [15, 16]. Figure 3 shows the atomic structure of divacancies obtained by DFT and experimental images obtained by TEM.

The formation energy of DV is equal to $E_{DV} = 7.5$ eV and is less than that of SV, the length of the newly formed bond is $b_{DV} = 0.17$ nm. The transformation barrier values for the transition $5-8-5 \rightarrow 555-777$ are 5.17 - 5.27 eV [8, 9]. All three divacancy states are stable at room temperature.

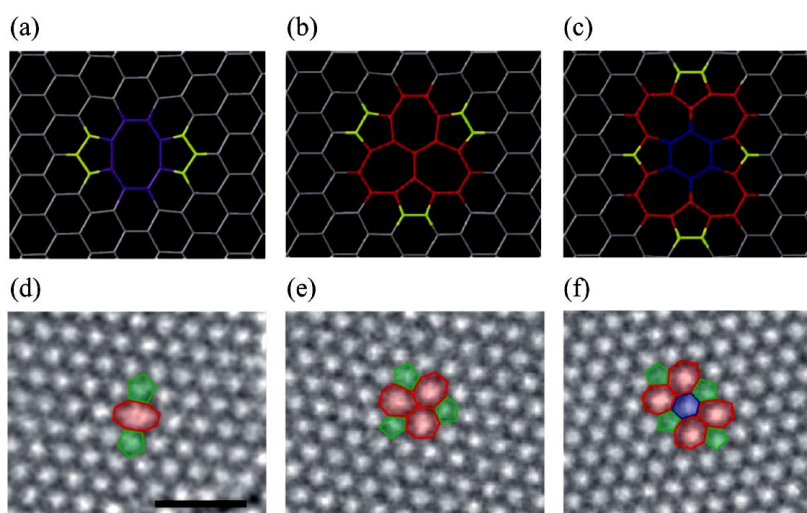


Figure 3. Divacancy in graphene. Atomic structures obtained from DFT calculations (a-c). Experimental TEM images corresponding to atomic models (d-f). Here defect 5-8-5 (a, d), defect 555-777 (b, e) defect 5555-6-7777. (c, f) [4].

The DV defect is caused by a dangling bond, whereas the 5-8-5 defect causes only local deformations. Being a saturated eight-membered ring compound, the cyclooctane (CH_2)₈ molecule also has a non-planar structure, resembling a crown or a boat. Since

defect 5-8-5 also has significant local curvature, the system is replaced with defect 555-777 or 5555-6-7777 to reduce local curvature. Three different reconstructed states of divacancy in graphene are usually observed in it under electron irradiation (Figure 4).

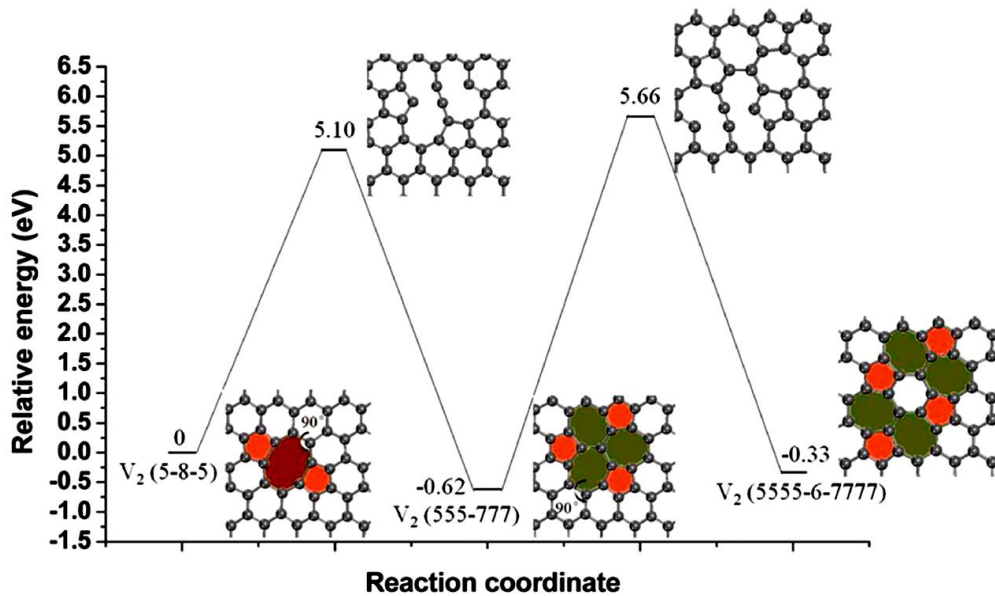


Figure 4. Schematic representation of the structure and energetics of three divacancy states in graphene: the $V_2(5-8-5)$ state, the $V_2(555-777)$ state, and the $V_2(5555-6-7777)$ state and the transition states for the transition between the V_2 (states 5-8-5) and $V_2(555-777)$ and between the states $V_2(555-777)$ and $V_2(5555-6-7777)$ [2].

Multivacancies in graphene

The removal of more than two carbon atoms, known as multiple defects or multivacancies, can result in a larger, more complex defect. In this regard, one would expect to observe a more or less random selection of vacancies. Therefore, local rearrangement of the lattice around multivacancies and the formation of a random set of non-hexagonal polygons is possible. Two pentagons and one octagon appear for the reconstructed double vacancy, resulting in the absence of dangling bonds [17]. Multivacancies can be created by modern physical and chemical methods [18-21]. Research results show that multivacancies are more easily formed than monovacancies under electron irradiation [22]. Calculations show that the energy of formation of multivacancies in graphene and carbon nanotubes is significantly lower than the energy of formation of monovacancies [23-26]. The formation energy of the 5555-6-7777 defect is between 5-8-5 and 555-777 (Fig. 4) and is about 6 eV with a bond length of about 0.23 nm [27, 28].

Peierls–Nabarro barrier

In [29], our proposed model of the surface layer of atomically smooth metals is generalized. To determine the thickness of the surface layer of various compounds, the size dependence of the melting temperature $T_m(r)$ was used:

$$T_m(r) = T_m(\infty) \cdot (1 - R(I)/r), \quad r \gg R(I), \quad (1)$$

$$T_m(r) = T_m(\infty) \cdot (1 - R(I)/(R(I) + r)), \quad R(0) \leq r \leq R(I).$$

Here the first formula coincides with the formula of R. Tolman [30], where $R(I) = 2\delta$, δ is the Tolman parameter, which is not determined experimentally. The second formula is further defined in the region $R(0) < r < R(I)$, so that when $r = 0$ the first formula does not go to infinity. The parameter $R(I)$ is related to the surface energy γ by the formula [29]:

$$R(I) = 2\gamma\nu/RT. \quad (2)$$

Here γ is the surface energy of the massive sample; ν – volume of one mole; R – gas constant; T – temperature. In [31] it is shown that, with an accuracy of 3%, the following is true:

$$\gamma = 0,70 \cdot 10^{-3} \cdot T_m \text{ [J/m}^2\text{]}, \quad (3)$$

where T_m is the melting temperature of the solid (K). The relationship holds for all metals and for other crystalline compounds. At $T = T_m$ from (2) we obtain:

$$R(I) = 0,17 \cdot 10^{-9} \nu \text{ (m)}. \quad (4)$$

Equation (4) shows that the thickness of the surface layer $R(I)$ is determined by one parameter – the molar (atomic) volume of the element ($\nu = M/\rho$, M – molar mass (kg/mol), ρ – density (kg/m³)), which changes periodically in accordance with table D.I. Mendeleev.

We compare the $R(I)$ monolayer with the Peierls–Nabarro barrier, which is equal to the force of interatomic interaction [32, 33]. In contrast to the Frenkel–Kontorova model [34], as well as works [35, 36] and others, we will propose a model that can be used to estimate the barrier $F(I)_{P-N}$ and voltage $\sigma(I)_{P-N}$ the Peierls – Nabarro:

$$F(I)_{P-N} = \gamma \cdot R(I)/n = \gamma \cdot a, \quad (5)$$

$$\sigma(I)_{P-N} = F(I)_{P-N}/S = \gamma/a = E \cdot \varepsilon(I),$$

where n is the number of layers in layer $R(I)$; a is the lattice constant; S – barrier area (a^2), $\sigma(I)_{P-N}$ – Peierls–Nabarro stress; E – Young’s modulus; ε represents the relative elongation of the lattice parameter in the direction of the external force F . In the case of graphene, $R(I) = a = 0.246 \text{ nm}$, $n = 1$, $\gamma = 3157 \text{ mJ/m}^2$.

Peierls–Nabarro barrier and parameters of vacancies in graphene

Using equations (1) – (5), we calculate the energy parameters of graphene and vacancies in graphene (Table 1).

Table 1.

Parameters of graphene and vacancies in graphene

Parameter	$F(I)_{P-N}$, 10^{-9} N	$\sigma(I)_{P-N}$, MPa	F_{CV} , 10^{-9} N	$\sigma(I)_{CV}$, MPa	F_{DV} , 10^{-9} N	$\sigma(I)_{DV}$, MPa	F_D , 10^{-9} N	$\sigma(I)_D$, MPa
Graphene	0,26	4268	-	-	-	-	-	-
Monovacancy	-	-	0,65	36111	-	-	-	-
Divacancy	-	-	-	-	0,44	25872	-	-
Defect 5555–6–7777	-	-	-	-	-	-	0,26	11304

From Table 1 it follows that the Peierls–Nabarro stress for pure graphene is $\sigma(I)_{P-N} = 4.3$ GPa and then decreases with increasing number of defects. This value of the Peierls–Nabarro stress leads to warping of sheets of pure graphene [2, 37]. In graphene, the deformation $\sigma(I)$ of the quasi-two-dimensional lattice created by the defects listed above can induce strong pseudomagnetic fields, promote the appearance of new Landau levels and paramagnetic centers, and have a significant impact on the electronic characteristics [38–43]. From Table 1 it follows that the Peierls–Nabarro barrier for pure graphene is $F(I)_{PN} = 0.26 \cdot 10^{-9}$ N, and for typical steel $F(I)_{PN} = 0.5 \cdot 10^{-9}$ N. A monovacancy has a large Peierls barrier – Nabarro, although they are not easy to form. The Peierls–Nabarro barrier inhibits the movement of dislocations in metals and leads to its strengthening [44]. Defects in graphene, which can inhibit the movement of dislocations, are more easily formed under electron irradiation [22].

The displacement of monovacancies outside the graphene plane is (see above) $d_{CV} = 0.018$ nm and, therefore, $d_{DV} = 0.027$ nm and $d_D = 0.046$ nm (see Table 1). In [45], the formation and movement of dislocations in graphene was studied in real time using high-resolution transmission electron microscopy. It was established in [45] that the source of dislocations in graphene are the so-called Stone–Wales defects, which are formed as a result of rotation of the C–C bond through an angle of 90° , as a result of which two pentagons and two heptagons appear in the hexagonal lattice. Dislocations move by sliding or crawling at a speed of ~ 0.1 nm/min. Each dislocation creates a deformation field in its vicinity, which extends over ~ 1 nm.

Conclusion

Today, there are several mechanisms of dislocation braking, which can be divided into two groups. The first group discusses the inhibition of dislocations due to the presence of potential barriers in crystals caused by various structural defects, including the Peierls–Nabarro barrier. The second group discusses the inhibition of dislocations due to the presence of dynamic interaction in crystals. This includes interaction with electrons, phonons, excitons, magnons and other elementary excitations of the crystal lattice. The role of the latter excitations is insignificant for most crystals, but the interaction with phonons is most significant. As we have shown, the Peierls–Nabarro barrier in graphene is maximum for a monovacancy.

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PSYCHOLOGICAL SCIENCES

GENDER DIFFERENTIATION OF LIFE PROSPECTS IN EARLY ADOLESCENCE

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ГЕНДЕРНА ДИФЕРЕНЦІАЦІЯ ЖИТТЄВИХ ПЕРСПЕКТИВ У РАННЬОМУ ЮНАЦЬКОМУ ВІЦІ

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Abstract

The article is devoted to the issues of gender differentiation of life prospects in early adolescence. This age is interesting because young people are just beginning their independent life. While studying at university, they acquire a profession that will help them achieve their goals in the future. The process of determining life prospects is influenced by personal preferences, intentions and opportunities, as well as the social and economic situation in society. It is subject to changes in the popularity of certain professions and shifting priorities. They determine the content of life prospects and the forms of their realisation. Intentions for the future include tasks for both the short and long term. They are quite individual, with gender differentiation evident in them. This is due to socio-cultural expectations that determine the roles, stereotypes and opportunities available to young people at an early stage of their lives. Girls and boys place different emphasis in this context, have different views on dominant and secondary perspectives, as they understand their social purpose differently. The results of our research will help to better understand the gendered nature of life strategies and ambitions of young people, and will also contribute to the effectiveness of social programmes aimed at developing and supporting young people at the beginning of their independent life.

Анотація

Стаття присвячена питанням гендерної диференціації життєвих перспектив у ранньому юнацькому віці. Цей вік цікавий тим, що молоді люди лише розпочинають самостійне життя. Вони навчаючись в університеті, здобувають професію, яка допоможе у майбутньому досягти наміченого. На процес визначення життєвих перспектив впливають особисті уподобання наміри та можливостей, а також соціальний та економічний стан суспільства. У ньому відбувається зміна популярності певних професій, змінюються пріоритети. Саме вони визначають зміст життєвих перспектив та форми їх реалізації. Наміри на майбутнє

містять задачі як на найближчу так й на віддалену перспективу. Вони досить індивідуальні, у них проглядається гендерна диференціація. Це пов'язано з соціокультурними очікуваннями, які визначають ролі, стереотипи та можливості, доступні молодим людям на ранньому етапі їхнього життя. Дівчата і хлопці по-різному розставляють акценти у цьому контексті, мають своє бачення на домінуючі й другорядні перспективи, оскільки по-різному розуміють своє соціальне призначення. Результати нашого дослідження допоможуть краще зрозуміти гендерну сутність життєвих стратегій, амбіцій планів молодих людей, а також сприятимуть підвищенню ефективності соціальних програм, спрямованих на розвиток та підтримку молоді на початку їхнього самостійного життя.

Keywords: life prospects, gender differentiation, motive, values, profession, personality, early adolescence.

Ключові слова: життєві перспективи, гендерна диференціація, мотив, цінності, професія, індивідуальність, ранній юнацький вік.

Постановка проблеми. Життєві перспективи раннього юнацького віку, безперечно, є ключовим елементом формування особистості та подальшого життєвого шляху кожної людини. Формування їхнього складу залежить від особистих уподобань, намірів та можливостей, а також від суспільних норм, сучасних пріоритетів, культурних уявлень та впливу соціального оточення. Вони визначають зміст життєвих планів, які будуть реалізовані по закінченню університету та отримання документу, що надає право виконувати професійні обов'язки у певній виробничій сфері. Наміри на майбутнє містять задачі як на найближчу так й на віддалену перспективу. Вони досить індивідуальні, у них проглядається гендерна диференціація. Це пов'язано з соціокультурними очікуваннями, які визначають ролі, стереотипи та можливості, доступні молодим людям на ранньому етапі їхнього життя. У зв'язку з цим, дослідження та аналіз гендерної диференціації є вельми актуальними та важливими для розуміння та підтримки розвитку молоді, їхніх уподобань, можливостей та перспектив.

Ця стаття спрямована на дослідження змісту життєвих перспектив, які визначаються у ранньому юнацькому віці. Дослідження покликане розкрити ключові аспекти впливу гендерних ролей та очікувань на формування життєвих стратегій, амбіцій, планів та можливостей молодих людей у цьому періоді їхнього життя. Виокремлення та розуміння цих аспектів може сприяти підвищенню ефективності соціальних програм, спрямованих на розвиток та підтримку молоді, незалежно від гендерної приналежності, а також сприяти створенню більш рівних умов для розвитку та самовираження у ранньому юнацькому віці.

Мета: дослідити особливості гендерної диференціації життєвих перспектив у ранньому юнацькому віці

Завдання: організувати емпіричне дослідження та на основі отриманих результатів проаналізувати зміст життєвих перспектив у дівчат і хлопців раннього юнацького віку.

Аналіз останніх досліджень і публікацій. Життєві перспективи були предметом багатьох наукових досліджень. В їхній основі лежать уявлення людини про перспективи того чого вона хоче досягти у майбутньому. Життєві перспективи можуть бути відносно короткостроковими або довгостроковими та можуть включати такі аспекти як

кар'єра, освіта, сім'я, подорожі, волонтерство, самовдосконалення, спорт тощо[1;3;6].

Соціологи розглядали їх як вектори розгортання майбутнього. Цей процес буде супроводжуватися певними подіями, наслідки яких є бажаними, або небажаними. Плануючи життя наперед людина визначає важливість подій, наскільки вони віддалені та доленосні для неї та наскільки вона може вплинути на них. У такий спосіб вона вибудовує часово-подієвий каркас життєвої перспективи. Наповненість життєвих пріоритетів визначається за кількістю доленосних або важливих подій, які відбудуться у межах прогнозованого часу[5].

Психологи життєву перспективу розглядають як цілісну картину майбутнього, у вигляді прогнаних й очікуваних подій, які визначають соціальну цінність та сенс особистісного життя. На цей процес суттєвий вплив мають катаклізми (пандемія, війна), які відбуваються у суспільстві та кардинально можуть змінити розвиток подій й відповідно реалізацію життєвих планів.[2] За таких умов, актуальною стає психологічна допомога, що спрямована на гармонізацію життя та відновлення позитивної проєкції власного життя на віддалену перспективу, з врахуванням гендерних особливостей клієнтів[7].

Виклад основного матеріалу. У емпіричному дослідженні прийняли участь 200 студентів раннього юнацького віку (17-18 років). 100 хлопців та 100 дівчат. Вони навчаються на перших курсах Волинського національного університету та Луцького національного технічного університету.

Першою була застосована «Автобіографічна методика Кроніка». Інструкція до неї пропонує опитанту вказати свій наявний вік та межі свого біологічного існування, тобто, до скількох років він доживе. Наступним завданням, було визначення рівня насиченості подіями свого минулого, сьогодення та майбутнього за шкалою від одного (найменший рівень) до десяти (найвищий рівень).

50% юнаків планують дожити до 80 років. За рівнем насиченості приємними подіями спостерігається певна стабільність. Він найчастіше сягає позначки 7 балів і більше. При визначенні свого психологічного віку, то у 80% він сягнув позначки 20-21 рік. Тобто бачать себе старшими на 2 або 3 роки, хоча в реальності їм 17-18 років. У решти осіб із цієї групи показник «психологічний вік» збігається з реальним біологічним віком.

25% до планують дожити до віку 70 років. У них прослідковується тенденція спаду рівня насиченості подіями в особистому житті на майбутню перспективу. Так, на теперішній час він становить 8-9 балів, то ближче до відмітки фіналу власного буття цей рівень очікувань позитивного опускається до позначки, в середньому, 5 балів у період зрілості та до 3 у період старості.

Схожий регрес рівня насиченості приємними подіями й у 25% опитантів, що відміряли собі вік життя до 60 років. Відмінність лише у тому, що він ще більш стрімко падає з 9-10 балів в юнацькому віці до 3 балів у зрілому віці (35-45 років).



Рис. 1. Прогноз тривалості життя у хлопців

Наступною була методика «Футурологічне опитування (Концетричний тест Коттла).

Юнаки, які планують дожити від 70 до 80 років планують своє життя на період, в середньому, від одного до 5 тижнів.

Спогади про минуле, бачення сьогодення та уявлення майбутнього у формі трьох кіл показало, що вони мають однаковий діаметр

На заваді в реалізації визначених життєвих планів можуть стати як об'єктивні фактори: економічні проблеми та внутрішня політика у державі так й суб'єктивні – хвороби.

При визначенні майбутнього місця проживання, то 87% із цієї групи респондентів зафіксували бажання залишитися за наявною адресою, або змінити її в межах певного регіону України. Решта 13 % планую облаштовувати своє життя за кордоном. Власні здібності з віком стали кращими, не знало суттєвих змін й власне здоров'я. Планують працювати за тим фахом, який й здобувають навчаючись в університеті. Це допоможе їм до 40 років: побудувати власний будинок; придбати власний автомобіль; мандрувати по світу на власний розсуд; при цьому мати високу кваліфікацію та авторитет. Стосовно питання створення сім'ї, то 78% із цієї групи написали у відповідній графі категоричне «ні», решта 28% розглядають таку перспективу та вказують: одна, або дві дитини. При цьому вони на 95% відсотків переконанні, що їхнім планам ніщо не завадить. Невелика частина із цієї групи, а таких ми виявили 3%, виявили занепокоєння про можливість втрати до 40 років житло, здоров'я та залишитися на самоті.

У процесі життя (думають), що вони згодом стануть сміливішими, сильними та багатими. Від інших людей очікують проявів доброти, комунікабельності та розуму.

Життєві плани обговорюють з батьками та друзями (93%). Решта (7%) тримають у секреті свої

плани. Стосовно підтримки, то, в основному, покладаються виключно на себе (43%), батьків(33%) та друзів (24%). Ефективність реалізації життєвих перспектив залежить від самої людини, переконані респонденти із цієї групи. У них також відсутні сумніви стосовно власних здібностей. Тому, вони усі впевненні на 80-100%, що їм вдасться здійснити намічене.

Стосовно диференціації спогадів подій минулого й планів на майбутнє. Цю групу опитантів приємно бентежать спогади про мандрівки з батьками, про час проведений з друзями, завершення школи та вступ в університет. У планах на майбутнє переважають позитивні тенденції: завершити навчання, відкрити власну справу, заробити грошей, придбати будинок та автомобіль, мати хороше здоров'я. Лише у 3% ми помітили в перспективах бажання створити сім'ю, тобто жити не лише заради себе, а й заради іншої людини.

Проаналізуємо результати у хлопців, що планують дожити до віку 60 - 70 років (25%). Вони планують життєві події в межах від кількох тижнів до 1 місяця. Діаметр кругів, що символізують минуле, сьогодення та майбутнє тотожний. На шляху до омріяного, на заваді можуть стати економічна ситуація в державі та внутрішня її політика. Подальше проживання планують, або за кордоном (50%), або залишитися дома (теж 50%). Рівень власних здібностей та здоров'я не зазнав суттєвих змін. Після завершення навчання в університеті планують працювати за тією спеціальністю, яка буде вказана в дипломі.

До 40 років мріють мати власний будинок та придбати автомобіль. Питання створення сім'ї у майбутньому, більшість, не розглядає (97%). До цього ж терміну, більшість(97%) вважає, що існує загроза втратити роботу та здоров'я.

У майбутньому планують стати сильнішими й добрішими, Такого ж очікують отримати від оточуючих. У батьки й друзі у пріоритеті при обговоренні

планів та надані консультацій, хоча покладаються, виключно, на себе.

Стосовно подій, що мають різний емоційний відтінок, то негативних у переліку ми не побачили, як у минулому так й у теперішньому часі. У позитивних спогадах присутні такі події: родинні свята та мандрівки, дозвілля проведене з друзями. Майбутні перспективи теж мають позитивний емоційний заряд: завершення навчання, робота, власна справа та придбання автомобіля. Впевненість, що досягнуть бажаних життєвих цілей становить 80-100%.

У третій групі юнаків(25%), що визначили термін свого життя від 50 до 60 років, спостерігається наступна тенденція: планування свого життя марна справа; минуле, теперішнє й майбутнє, зображене у вигляді кіл, має однакові пропорції; основними бар'єрами в реалізації життєвих планів бачать хворобу та сімейні обставини; планують жити в іншому місті, впевненість у собі становить лише 50%; вважають, що власні здібності та здоров'я з віком не змінилися; бажають працювати за спеціальністю, це допоможе придбати будинок, автомобіль, а питання створення власної сім'ї не розглядається взагалі.

Доволі сумними виглядають перспективи до 40 років: «досягти спокою», страх набуття статусу безробітного або взагалі померти. Вимоги до себе: бути більш добрішим та комунікабельними, від інших очікують сміливості та розуміння. Обговорюють плани з друзями, або тримають у секреті. Розраховують, або на себе, або на допомогу друзів. Впевненість, що омріяного досягнуть становить 50%.

Стосовно переліку подій, які респонденти уже пережили, то у ньому зустрічаються як сумні, смерть когось із родини, так й веселі: зустрів друга, вступ в університет, придбання телефону. У майбутньому очікують: придбати авто, будинок, стати сильним та спокою.

Розглянемо та проаналізуємо результати у дівчат раннього юнацького віку.

Найбільше число становить тих (47%) хто розраховує прожити від 80 до 100 років. Минуле багате на приємні події: дитинство шкільні роки, а також

сьогодення: вступ і навчання в університеті отримали найвищий рівень насиченості 8 - 10 балів бо пов'язані з приємними подіями. Після 35 років межа цього показника поволі опускається до рівня 5-7, а після 45 років йде різко вниз до позначок 1-3 бали. Це свідчення того, що дівчата у зрілому та похилому віці, в майбутньому, не очікують нічого приємного, а життя буде сповнене негативними подіями. Стосовно оцінки свого психологічного віку, то ми спостерігали наступну диференціацію у цій групі опитаних: у 50%, за розрахунками, психологічний вік становить 18 років, тобто тотожний з біологічним, у інших 50% він становить 25-26 років, тобто йде випередження біологічного на 7-8 років.

Наступна друга (41%) визначила крайні межі свого життя від 60 до 80 років відповідно. Дівчата визначила насиченими періодами свого життя теперішню реальність та наступні 10-20 років життя (9-11 балів). Надалі рівень насиченості йде на спад, Особливо це помітно після 50 років. Стосовно більш віддаленого майбутнього, то рівень насиченості на події становить всього 3-4 бали. Пережите минуле теж оцінено доволі низько у межах тих же 3-4 балів. Це стосується 73% відповідей дівчат із цієї групи. При визначенні власного психологічного віку, то різниця між реальним(біологічним) і ним становить 1-2 роки.

Для решти 23% найвищі показники рівня насиченості приємними подіями 9-10 балів припадає прожити роки у віці 13-16 років. Теперішній час оцінений середніми балами(5-6). Рівень сподівання на позитивні події у майбутньому ще нижчий -3-4 бали. Їхній психологічний вік, за їхніми ж розрахунками, коливається у межах 23-25 років, хоча, реальний (біологічний) 17-18 років відповідно.

Третя а група дівчат найменш чисельна 12%. Їх об'єднує те, що вони визначили межі свого біологічного існування на позначках від 40 до 60 років. Оцінки минулого, теперішнього життя й майбутнього за рівнем насиченості близькі до середніх показників 4-6 балів. Тобто події уже пережиті, а також сьогодення та майбутні очікування й сподівання не мали, не мають й не будуть мати високого позитивного емоційного потенціалу. Оцінки, показники психологічного(17-18років) віку співпадають з реальним біологічним віком (16-17років).



Рис. 2 Прогноз тривалості життя у дівчат

Розглянемо отримані результати за «Циклічним тестом часу» (тест Коттла). У першій групі 47% дівчат планують своє життя на період терміном від 1-2 тижнів до 1-2 місяців.

97% із них намалювали коло, що означає «майбутнє», значно більшого діаметру. У 3%, навпаки, коло «теперішнє» за розмірами більше від інших. Їх об'єднує те, що своє «минуле» вони представили у вигляді кола, що значно поступається розмірами двом попереднім. Звідси можна допустити думку, що більшість дивиться з оптимізмом у майбутнє. Хоча, якщо взяти до уваги отримані результати за методикою Кроніка, то рівень насиченості приємними подіями після 45 років різко йде униз. Причина у сприйнятті юності, зрілості та старості. Два перших вікових періоди розглядаються як періоди найбільших можливостей, а останній як межа, за якою відбувається стрімке падіння активності.

Здійсненню намічених планів може стати на заваді економічний стан у державі та сімейні обставини. Ця ж група дівчат не планує виїжджати за кордон, а залишитися вдома, або здійснити внутрішню міграцію, тобто переїхати в інше місто, район, область України.

Вони, виключно (на 80-90%), покладаються на себе, хоча у якості можливих бар'єрів розглядають непередбачені обставини, на які неможливо вплинути. Здібності не зазнали ніяких змін, так вважає 68%, решта відчули якісні зміни у своїх можливостях. Не зазнало змін й власне здоров'я. Після завершення навчання планують працювати за отриманою спеціальністю, займатися самоосвітою та отримати високу кваліфікацію. Це допоможе до 40 років: придбати будинок, або 2-3 кімнатну квартиру; створити власну сім'ю та народити двох дітей; придбати автомобіль, на якому будуть здійснювати мандрівки. Фінансові накопичення у банках планує лише 1% із цієї групи.

Більшість дівчат (98%) впевнені, що до 40 років, з ними буде все гаразд, лише у 2% відсотків є побоювання набуття статусу безробітного. Протягом життя вони хочуть стати більш розумнішими, здоровішими й багатшими. Від інших людей очікують більшої доброти та комунікабельності. Свої життєві плани довіряють та обговорюють: з батьками та друзями 62%, з коханою людиною (хлопцем) 19%, тримають у секреті 19%. При цьому 50% сподіваються на підтримку батьків, 44% розраховують лише на себе, 6% відсотків на підтримку майбутнього чоловіка. При цьому, вони доволі впевнені на 80-90%, що їхні намічені плани будуть втілені у життя.

Стосовно 5 подій які мали місце в їхньому житті, то найчастіше згадують: мандрівки із родиною, проведення часу з друзями. Події, які пов'язані з майбутнім: створення власної сім'ї, народження дітей, придбання власного житла.

Група дівчат, що планують прожити до 80 років, а таких 41%. Згідно отриманих результатів за методикою Коттла, більшість (71%) дівчат із цієї планує своє життя в межах від одного тижня до 2-3 місяців. Решта 23 % життєві перспективи визнача-

ють в межах від одного до 3 років. 61% з оптимізмом дивляться у майбутнє. 39% живуть теперішнім часом. Це видно по діаметру намальованих ними, які символізують майбутнє та сьогодення. Події про минуле турбують їх мало, а тому символічні кола мають найменший розмір.

На заваді реалізації життєвих планів можуть стати сімейні обставини, економічні проблеми та внутрішня політика у державі Україна. Вони на 80-90% покладаються виключно на себе, хоча й допускають появу не залежних від них обставин, яких саме не вказують. У пошуку кращого життя не збираються покидати її територію, можливі лише внутрішні міграційні процеси: переїзд в інше місто та область. Переконані у ефективності своїх здібностей. За їхньою допомогою сподіваються отримати диплом про вищу освіту, працювати за спеціальністю. Отримана професія стане в нагоді й допоможе до 40 років придбати власне житло (будинок, квартиру), гарний автомобіль, створити власну сім'ю, народити двох дітей та зі своєю родиною мандрувати. 60% оптимістично налаштовані, що за цей віковий період з ними буде гаразд, 40% не виключають найгірші сценарії: самотність, статус безробітного, або власна смерть.

З роками прогнозують, що стануть багатшими, розумнішими й сміливішими. Від інших людей очікують на прояви доброти, сміливості та комунікабельності. До обговорення своїх життєвих перспектив долучають батьків, друзів, кохану людину, на їхню підтримку й розраховують. Ті хто свої плани тримає у секреті, а таких виявилось 3%, то вони розраховують винятково на себе.

При аналізі переліку подій минулого, то домінують позитивні такі як: шкільні роки, проведений час з друзями та подорожі з родиною. З майбутнім вони пов'язують наступні: своя сім'я, народження дітей, робота, придбання житла та мандрівки.

Вивчення відповідей дівчат, які передбачають своє біологічне життя до 60 років, а таких 12%, показало, що вони більше сподіваються на майбутнє, менше на сьогодення, а ще менше приємних вражень від минулого. Перешкодами у здійсненні власних мрій вони вбачають економічний стан у державі й сімейні обставини. Вони їх не лякають, а тому не збираються виїжджати за кордон, а залишитися «вдома», або переїхати в інше місто чи область. Переконані на 80-100%, що здійснення омріяного залежить від них самих, а їхні здібності, здоров'я не зазнали змін. Після завершення навчання в університеті планують до 40 років: працювати, щоб придбати власне житло та дорогий автомобіль, мати заощадження в іноземній валюті в банках. Це допоможе утримувати двох дітей, зберегти здоров'я та відкрити можливість мандрувати. При цьому вони переконані, що з ними нічого не приємного не станеться. З віком прогнозують стати більш розумними, сміливішими, багатшими. Такого ж очікують від свого соціального оточення додаючи, лише, одну позицію «комунікабельності». Свої плани обговорюють з батьками та друзями. На їхню підтримку й розраховує 97% респондентів із цієї групи. Решта 3% на самого себе.

Самим цікавим виявився перелік з п'яти подій пов'язаних з минулим та така ж кількість з майбутнім. Вони викликають у спогадах як неприємні так й приємні відчуття. З минулого їх турбують: початок війни, хвороба, або смерть близької людини, вимушене життя за кордоном; викликає приємні спогади: подарунки та мандрівки з батьками, час проведений з друзями, знайомство з протилежною статтю. У переліку майбутніх подій ми не зустріли таких, що уже неприємно бентежать свідомість дівчат, а лише такі, які принесуть позитивні емоції: завершення війни та навчання в університеті, придбання власного житла, створення сім'ї, подорожі.

Основна причина, чому вони визначили малий термін життя є потрясіння від смерті рідної людини: діда, батька, брата, племінниці.

Висновок. За отриманими результатами ми можемо зробити висновки, що чим більший термін планують прожити, то тим більш оптимістичні плани на майбутнє життя. Так, у 50% юнаків, яким на момент дослідження було 17-18 років, планують дожити до 80 років. Планують своє життя на період, в середньому, від одного до 5 тижнів. За рівнем насиченості приємними подіями спостерігається певна стабільність на рівні 7 балів. При визначенні свого психологічного віку, то бачать себе старшими на 2 або 3 роки, хоча в реальності їм 17-18 років. Ця група не планує пошук кращого життя за кордоном, а бажає працювати за фахом, щоб побудувати власний будинок; придбати власний автомобіль; мандрувати по світу на власний розсуд; при цьому мати високу кваліфікацію та авторитет. Наміри створити власну сім'ю, майже не прослідковуються. При цьому вони на 95% відсотків переконанні, що їхнім планам ніщо не завадить. У них також відсутні сумніви стосовно власних здібностей. Тому, вони усі впевнені на 80-100%, що їм вдасться здійснити намічене.

У юнаків, які планують дожити від 50 до 70 років прослідковується тенденція спаду рівня насиченості подіями в особистому житті на майбутню перспективу. У цієї групи осіб показник «психологічний вік» збігається з реальним біологічним віком. Вони також планують працювати за спеціальністю, мати власний будинок та придбати автомобіль, створення власної сім'ї не в пріоритеті. На шляху омріяного, на заваді можуть стати економічна ситуація в державі та внутрішня її політика. Подальше проживання планують, або за кордоном (50%), або залишитися дома (теж 50%). Юнаки, що визначили термін свого життя від 50 до 60 років вважають планування свого життя наперед, марною справою. Хоча мріють мати власне житло й автомобіль. Впевненість у собі становить лише 50%. Доволі сумніми виглядають перспективи до 40 років: «досягти спокою», страх набуття статусу безробітного або взагалі померти.

Дівчата більш оптимістичні у прогнозах терміну власного життя. Минуле й теперішнє оцінили отримали найвищий рівень насиченості бо

пов'язані з приємними подіями. Цей показник різко падає після 45 років, тому що у зрілому та похилому віці, в майбутньому, не очікують нічого приємного, а життя буде сповнене негативними подіями. При визначенні власного психологічного віку, то різниця, у більшості, між реальним (біологічним) і психологічним становить 1-2 роки.

Дівчата більш оптимістичні у прогнозах терміну власного життя. Минуле й теперішнє оцінили отримали найвищий рівень насиченості бо пов'язані з приємними подіями. Цей показник різко падає після 45 років, тому що у зрілому та похилому віці, в майбутньому, не очікують нічого приємного, а життя буде сповнене негативними подіями. Стосовно оцінки свого психологічного віку, то він, у більшості, майже тотожний з біологічним. Дівчата планують своє життя на період терміном від 1-2 тижнів до 1-2 місяців. Більшість з них дивиться з оптимізмом у майбутнє. Хоча, якщо взяти до уваги отримані результати за методикою Кроніка, то рівень насиченості приємними подіями після 45 років різко йде униз. Причина у сприйнятті юності, зрілості та старості. Два перших вікових періоди розглядаються як періоди найбільших можливостей, а останній як межа, за якою відбувається стрімке падіння активності.

Здійсненню намічених планів може стати на заваді економічний стан у державі та сімейні обставини. Дівчата не планують виїжджати за кордон, а бажають залишитися вдома, або здійснити внутрішню міграцію, тобто переїхати в інше місто, район, область України.

Вони, виключно (на 80-90%), покладаються на себе, хоча у якості можливих бар'єрів розглядають непередбачені обставини, на які неможливо вплинути. Здібності, або не зазнали ніяких змін, так вважає 68%, решта відчули якісні зміни у своїх можливостях. Не зазнало змін й власне здоров'я. Після завершення навчання планують працювати за отриманою спеціальністю, займатися самоосвітою та отримати високу кваліфікацію. Це допоможе до 40 років: придбати будинок, або 2-3 кімнатну квартиру; створити власну сім'ю та народити двох дітей; придбати автомобіль, на якому будуть здійснювати мандрівки. Фінансові накопичення у банках планує лише 1% із цієї групи.

Більшість дівчат (98%) впевнені, що до 40 років, з ними буде все гаразд, лише у 2% відсотків є побоювання набуття статусу безробітного. Протягом життя вони хочуть стати більш розумнішими, здоровішими й багатшими. Від інших людей очікують більшої доброти та комунікабельності. Свої життєві плани довіряють та обговорюють: з батьками та друзями 62%, з коханою людиною (хлопцем) 19%, тримають у секреті 19%. При цьому 50% сподіваються на підтримку батьків, 44% розраховують лише на себе, 6% відсотків на підтримку майбутнього чоловіка. При цьому, вони доволі впевнені на 80-90%, що їхні намічені плани будуть втілені у життя.

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STRUCTURAL COMPONENTS OF NATIONAL SECURITY PROBLEM

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Abstract

National security is the ability of a nation to meet its needs for self-preservation, self-reproduction, and self-improvement with minimal risk of harm to the core values of its current state. According to another definition, national security is a set of officially accepted views on the goal and state strategy in the field of ensuring the security of the individual, society and the state against political, economic, social, military threats and as well as external and internal threats of other states. In this article, it is noted that the problem of national security is one of the most actual and complex problems in modern social and political science, and therefore the study of its structural elements has particular importance. Also, in the article, the structural components related to the scope of the national security problem has been studied by giving a separate classification.

Keywords: national security, national interest, political culture, regional security, state security.

Introduction: First of all, it is necessary to clarify the six categories in which national security is divided according to the scope of our research.

- International security
- Geographical or regional security
- State security
- Public safety (security)
- Safety (security) of public groups
- Security of individuals [9. p.11-13].

The mentioned areas of security are perceived as interconnected and parallel. Just as the security of the state covers the field of international security, and regional, public, and individual security are also concepts of security that are considered in parallel with state security.

When talking about the structural composition of national security, it is necessary to pay attention to three main points.

The first is the public's perception of security. The public mass (nation, people, society, groups, parties, voters, etc.), which is decisive in all areas of security, plays the role of base. The structures of national security are formed taking into account the political, strategic and threat culture adopted by each nation.

Second, the structural view is made up of both political and legal views and interests of states.

The third is international and domestic legal standards.

Security is one of the main, even the most important organizational principles of modern states. Historically, security was organized according to the power potential of states, but in modern times, these standards are set according to the principles of international law and the balance of interstate political relations. National security, which is the central and key term of the international relations system, is the main determining factor in making internal and external political decisions for a state. Decision-makers have a

duty to inform their public of any internal and external political decisions that are contrary to national security policy, disclose their harm, and include measures against them on the agenda [24. p.212].

I. Political system and political culture

First of all, political culture is the parliament, government, political parties, political power, elections, constitution, etc. institutions that regulate the integrity, operation and management of the political mechanism within the political system in which each people lives. It covers all cultural presence, opportunities and behavior of determining political factors. According to G.M.Patrick, four main terminological frameworks are defined within the framework of political culture.

- The concept of "objectivity" termed by David Easton
- The concept of "subjectivity" brought up by Almond, Verba and Powell
- The concept of "heristic" (study) formed by Lisian V. Pyei
- The concept of "comprehensive" introduced by Fagen and Tusker [1.p.39].

The concept of objectivity introduced by D. Easton is based on the view or idea that political culture is independent of individuals, but takes into account their unity. According to him, the political existence of a nation depends on its history and social-moral relations, economic and political activities. That's why, political culture is perceived as a kind of reflection of public behaviors of individuals in front of politics.

Almond and Verba, two researchers who analyze political culture on the basis of subjectivity, in their works entitled *"The Civic Culture: Political Attitudes and Democracy in Five Nations"* point out the need to take into account each nation's character and historical behavior in the formation of political culture. In this sense, the authors state that political cultures are determined by three main characteristics:

First, it forms a narrow or parchial political culture (parchial political culture), which mainly reflects views connecting rural, urban and country types, and the attitude of citizens towards the central government based on this concept is far from being active and effective.

Second, citizens belonging to the political culture based on subjection and obedience (subject political culture) consider themselves a part of the central government and political system. The common enemy or threat defined by the center is clearly perceived by the citizens in the same category. Citizens with this view are not active even if they join the political authorities.

Citizens belonging to the political culture accepted in the third place (participant political culture) had an effective political identity. Citizens belonging to such a political culture judge the decisions made by the central governments and states, and try to determine the truth of the created image of the enemy or threat [2.p.17].

Interestingly, it is difficult to find a country with a political culture that is included in the last ranking. Although the European nations are included in this list, they have taken their place at the political authorities without judgment in the face of the black propaganda about terrorist attacks and Islamophobia that occurred in the 21st century.

Rye's ideas on the debate about the determinants of political culture for national security are also interesting. According to him, nations in political cultures, whether mass or individual, mainly react within the national unity to which they consider themselves to belong. Rye calls this "national identification" [18. p.77].

II. National security and strategic culture

The second determining factor in national security is the strategic culture. Strategy which derived from the Greek word "stratos ago" or "strategus", is a military term. In modern times strategy that went beyond the concept of military or military power began to cover other non-military factors. Along with the popularization of the term "culture", the behavior of peoples and nations began to be evaluated within the framework of strategic culture. The first theoretician of modern strategic culture was Carl von Clausewitz. According to him, the strategy is "an exam of moral and material powers". Clausewitz created this concept for war or threat. According to him, the war is a half of two wills. That is, the will to wage war is culturally determined by psychological factors" [10. p.163-173; p.3].

The fact that the peoples of the world saw themselves as part of the Soviet and counter-strategic culture from what parameters during the Cold War is a clear proof of this. A major leading force among strategic culture studies is the behavior that results from decision makers in different societies thinking differently and acting differently under similar conditions and decision stages [16. p.17].

One of the main reasons why strategic culture is decisive in the concept of national security is the attachment of nations to what identity they see themselves as a part of historical, cultural, moral, and religious point. For example, since the Turkish people perceive themselves on a different front against the Greeks in the strategic cultural sense, they show a strategic reaction in

the decisions made by the state towards Greece in accordance with their past and the historical process they have gone through [23. p.69].

The researchers who talk about a role of strategic culture in national security issues mainly point the attitude of three generations.

The attitude of the first generation is based on Jacques L. Snyder's concept of strategic culture. According to Snyder, "strategic culture is the sharing of sense reflexes and ideas of already accepted behavioral attitudes and conditions that members of a society possess and share with each other through education and training in their strategic styles" [19. p.8].

For example, representatives of the generation that spent a large part of their lives in the USSR have the same strategic cultural attitude in all matters related to the United States. This generation is considered to be the generation before 1980, and it should be taken into account that this generation played an active role in defining the concept of national security in a number of countries.

The second generation is accepted, generation with different strategic interests and views, formed after 1980. According to Johnston, there is a leadership-politics parallel in the strategic behavior of this generation in the face of national security issues. According to this generation's understanding, there is a deeper and hidden goal behind every political behavior. Leaders have different political goals than their stated ones. This indicates legal maneuvers and methods of the state in front of the enemies [12. p.39].

The third generation is the tough, picky, and definitely non-ideological generation that formed after 1990. Global security interests are above national and regional interests for this generation with more liberal-minded minds. Interestingly, the concept of security is more relevant to this generation than to the other two generations. Because in the global world, with the emergence of common, global forms and components of security (global warming, terrorism, chemical weapons, water problems, etc.), a new culture of security began to flourish [13. p.41].

According to Johnston, the advantages of the strategic culture of the third generation are even greater. Because the third generation's approach to security is variable, unlike the deterministic view of the first generation, and the casprological view of the second generation. For them, cultural relations are meaningful and important not because of historical and national values, but because of experiences. It is interesting that security for the third generation is perceived in global terms, and not in national and regional framework. In many cases, the views of this generation are inversely proportional to the understanding of the states about national security [17. p.8]. Johnston defines this generation's idea as "neorealist" [13. p.42].

III. National security. Social crowd and threat culture

The concept of threat which is the third factor determining public opinion in national security comes from itself. This is shortly called threat culture. As you know, researchers studying security issues in international relations recommend focusing on the cultural

views to which the masses are attached. Because this paves the way for the emergence of constructivist theories in the structural solution of security. People's concept of threat or threat culture is based on the logic of friend and enemy. Carl Smith explains his understanding of politics on the basis of "friend and enemy". According to him, the world that emerged after the First World War "is not a political union, but a political majority" [20. p.84].

In matters of national security, many states determine their behavior based on their people's traditional understanding of friend and foe. At the international level, this created the concept of "current friend and enemy change in international relations"., states define their relations for the sake of security and benefit among themselves according to this change. For example, the traditional "fear of the Turks" in the mentality of the European peoples plays an important role in the European Union's behavior towards Turkey. Also, in international organizations such as NATO and the Shanghai Economic Community, the concepts of friend and foe are defined according to strategic goals [6. p.65].

According to Katzenstein, the threat understood as a threat to one state in international relations is evaluated by another state in the same framework as the concept of alliance. This comes from "an epithet created by autonomous power politics" [14. p.3].

As a result, the basis of national security is the political, strategic and threat culture of the public in connection with threat. This is generally called security culture. In this case, the security culture is evaluated in six items:

- a) Security culture refers to the values shared by all individuals or the entire group of society at a group or higher level;
- b) Security culture is closely related to formal security issues in a society;
- c) Security culture is formed with the participation of society members;
- d) Security culture affects the behavior of society members;
- e) Security culture is formed by experiences gained from incidents, mistakes and wars, as well as reconciliations in a society;
- f) Security culture is very strong, stable and resistant to change [3.p.47-48].

The state is considered the main factor in national security. The state is considered a kind of security provider, its structural determinant and forming element. National security for national states is as important as national interests and national goals. Each state manages to protect its national interests and achieve its goals in proportion to ensuring its national security.

National power includes all the material and moral elements that a state will use to ensure its national interests and achieve its national goals. The elements that determine the national power of the state are the following: political power, economic power, military power, demographic power, geographic power, psycho-socio-logical and cultural power [4.p.29-30].

It is clear from this that power is the main factor in ensuring national security for states. Therefore, for a

long time, that is, until the 1990s, from the time when the issue of security was on the agenda, state power and state authority were understood as related to power. Here, too, military power was considered the main element. However, after 1990, especially with the "new concept of security" formed by the Copenhagen school, the identification of security with power is perceived. So, all the sources of power mentioned above began to form the scope of national security [5. p.5].

Barry Buzan emphasizes each of these parameters as the main elements of the safety net. Therefore, the main elements of national security are: political security, economic security, public or social security, military security, environmental security, geographical security [8. p.96-97].

According to Buzan, the most important feature of the new concept of security is the formation of parts of power and security structures known in a general sense and the presence of these parts in an effective condition [7. p.58].

Geographical factors sometimes create natural and unnatural hazards. For example, Cuba's military potential is the biggest threat for the United States, which has the largest military power in the world, and hurricanes, which every year have a big impact on the state budget and threaten the lives of many citizens, are also a source of danger [25. p.397].

Until the 21st century, when security was mentioned, the main factor was the states, as well as security areas, military and political issues were brought to the attention. But in the last few decades, states have begun to cease to be the main point of threats. This is because traditional concepts of security have been replaced by biological security, environmental pollution, terrorism, the limitation of the world's natural resources, migration, economic problems (hunger, famine, drought), mass infectious diseases, bacteriological weaponization, knowledge terrorism, etc. Currently, the sides of the concept of threat, which constitutes a risk for national security, are changing rapidly. Modern forms of threats such as blocking the bank and security systems of the state through computers, stealing knowledge archives have appeared. Such mass suicides, counter-propaganda campaigns targeting a certain institution of a state or the moral values of a people also create socio-psychological dangers. In this sense, some social organizations and movements aimed at solving social problems are affected without any reason or are perceived as part of a global threat. Animal rights and green protection organizations are unknowingly becoming an element of threat through the direction of certain networks. It turns out that in the current conditions, the borders of the concept of national security as a threat have expanded twice, and in return, the concept of threat has become more sensitive.

IV. Globalization and national security issues

In the globalized world, threats based on global security began to surpass national security. The new global relationship system has created a chain of virtual relationships in parallel. Along with the increase in the number of Internet users, permanent concepts and values have begun to form in virtual relationships. In 1995, there were 16 million Internet users in the world, and in

2000, this number increased to 360 million, and in the following 12 years, to 2.5 billion. Between 2000 and 2012, there was a 566 percent increase in the number of Internet users [26]. In 2018, this number reached 5 billion.

Virtual relations require the creation of virtual security networks, the creation of new forms and rules of control over mass social information networks. All these require expenses that exceed the capabilities of a state. In such a case, there is a need to create new global rules and concepts of security.

Along with social media, the concepts of "soft power" or "soft threat" also started to gain relevance. The connection of social media tools to global structures, the use of these networks by some powers to transmit and receive their understanding to the other side, also creates inequalities in the concept of global security. So, parallel to global relations, global competition is expanding.

Traditional national security structures were under state control. These structures were mainly implemented by: police organization, gendarmerie forces, army units and security organization.

These structures performed the regulatory role of the internal regulation of the security of each state. Those regular powers were regulated in accordance with the international law norms along with the rights of the states.

International law (*raison d'être*) and the main principle in its interaction constitute the characteristics and needs of the international political order. Within this order, there should be common terms on how to communicate in cases of coexistence or global enmity. No matter how scattered and different these views are, currently the international legal system has managed to form a certain pattern of its own [21. p.31-32]. M. Hart and A. Negri based on this point of view that "right (repeating the many forms that money acquires in the capitalist system) does not carry any value of its own like money, important conditions for the reproduction of social works, capitalist society, division of labor and colonization it is made up of the values it produces day by day [11. p.22]. The reason for this is not the issues raised by international law, but the world system to which the law is bound. Thus, modern international law is a product of a certain state and its emergence dates back to the times when capitalist production was effective. In the process of creating international law, it is mainly the emergence of capitalist states after monarchist states. Therefore, international law itself is unable to fully meet the general security of the world, since it is based on the security of capitalist industrial relations [22. p.19-20].

V. International parameters and national security factor

International law protects the rights of states based on the principle of reciprocity, protecting their rights, defending the rights of their citizens outside the country, and the right to common defense. All of these mentioned settings involve security issues. Looking at it from this framework, security in the world is currently perceived in three stages: country security (domestic, territorial, state), regional security (interstate, common

security), global security (migration, terrorism, nuclear-biological weapons, climate, human rights and so on.).

The country security is in the first place in the security system. Country security is divided into several categories: domestic security, territorial or geographical security and state security.

The main structural aspect of internal security is that each country has its own security organization. Ensuring the safety of citizens, guaranteeing their rights and freedom, preventing internal conflicts, etc. constitutes the main areas of internal security. Territorial or geographic security covers areas related to the protection of a state's national identity and existence. State security aims to eliminate the threats directed to the legal, political, economic and national principles defined in the constitution of each era. State security agencies, especially internal and external intelligence, control this area.

The main field of national security is intelligence, that is, the activity of intelligence agencies. Intelligence agencies are considered a primary aspect of national security.

Each state determines its own intelligence and intelligence mechanism. Information and events that are not intelligence for a state may be vital for another state. There are also states where intelligence controls the political and social life of the entire state. Stalin era USSR is an example in this regard. Intelligence systems and agencies are considered to be the main organization in the protection, and promotion of the values of security, which both form the concept of national security and set its parameters. In intelligence systems whose main activity is based on the information-analysis-evaluation prism, the protection of the state and the nation is above all kinds of profit, and the control bodies are carried out in this framework.

Intelligence systems are threat and threat prevention forces. After perceiving, evaluating and analyzing of the incidents such as crisis, rebellion, changing the constitutional values of the state, coup, conspiracy, creating unauthorized power and profit groups, threats, pressure, violence, developing action plans that will influence the main leaders and bodies of the state and so on by the intelligence groups, they take measures if necessary. The measures taken by intelligence groups may not always be unilateral, internal interference, redirection, receiving information, etc. action forms are among the methods used by intelligence.

Intelligence agencies define their activities in a chain of sharing, regulating and taking action with other agencies. In this sense, intelligence is considered the most operative aspect of security in matters of national, regional and global security.

The second stage of security is territorial or geographical security. Geographical or territorial security covers a specific area in national security. It includes many areas from urban security to security of energy sources and natural phenomena. According to researcher Wendt, there is an affinity between issues of territorial security and issues stemming from human nature. Since security is the basis of the human phenomenon, the security of the territory belonging to a

person and groups of people is the main condition of human destiny. For this purpose, many countries have formed their Geographical Information System. Geographical Information Systems are currently successfully applied in many fields, including the military field. From terrain analysis systems to satellite systems, from computer systems to various technological systems, Geographical Information Systems are widely used in security fields [15. p.3-4].

Conclusion

States constantly monitor regional security as well as their own national security standards. Each state has its own security thresholds, concepts, parameters and common control mechanisms of the region in which it is located. In the neighborhood relations, the states are obliged to take into account the security of the surrounding states as well as themselves, and adjust their own internal and national security accordingly. In this sense, regional security is the guarantee of internal security, as well as the key to global security.

The last structural stage of security is international security. Already in our modern world, international security issues are rapidly being formalized in the form of standardization, centralization and mutual assistance, leaving the framework of common concepts. Terrorism, global warming and climate change, migrations, human rights, national rights, nuclear and chemical weapons are governed through the legal standards of international security.

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DEVELOPMENT AND USE OF NONVERBAL COMMUNICATION IN CHILDREN WITH AUTISM SPECTRUM DISORDERS (ASD) AND THEIR PARENTS

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Abstract

The purpose of this publication is based on a literature review to highlight the main aspects of nonverbal communication and its application to create a stronger lasting "parent-child" relationship and in the education of children with ASD. The main approaches to teaching children with ASD are reviewed- learning through games, video movies, through their peers with typical behavior, through art. In all these, albeit diverse, approaches to learning, several common and important features stand out: 1. Reciprocity in activities - the child with ASD must feel the care and special attention and attitude towards him; 2. Encouragement to creativity, stimulation and integration of personal skills; 3. Absence of stress factors and the therapist's desire to build an environment and relationships with an atmosphere of calm and safety. 4. Nonverbal communication is the basis of each of the learning approaches. 5. The listed approaches can be applied in an integrated manner.

Keywords: autism, disorders, nonverbal communication, children, parents, therapy

INTRODUCTION

Autism spectrum disorder (ASD) is a diagnosis that includes significant social communication deficits/delays along with restricted patterns of interests and behaviors (17). There are no accurate statistics on the number of children with autism in Bulgaria. According to unofficial data from practice (7), there are about 140,000 children with autism in the country, while globally, according to the World Health Organization (2016) (54), ASD is found in one out of 160 newborn children in the world.

Communicating and reading the communication signals of the child with ASD is the first step in any successful therapy. People with ASD often also have language difficulties and according to a study by Brignell et al. (2018) (13) about 25% to 30% of children with ASD fail to develop functional language or are minimally verbal. The ability to communicate effectively is a fundamental life skill, and communication difficulties can have a number of adverse outcomes, including lower academic achievement, behavioral difficulties and reduced quality of life.

A number of authors (4) highlight nonverbal communication as a powerful tool in conducting therapies for people with ASD, which complements, and in many cases it is even more appropriate than verbal communication. Nonverbal communication is the basis of the so-called Augmentative and alternative communication (AAC), which is used mostly for children with ASD who are low verbal (25) (13).

According to specialists such as Siegel (1973) (47), Scharoun et al. (2014) (45) and others. physical activity, sports and dance (coordinated movement), as an important part of therapeutic activities related to nonverbal communication, have proven their benefits regarding the possibilities of improving communication skills and social development of children with autism. The application of dance movement therapy (DMT) as a syncretic method can "optimize the psychomotor behavior of youth with ASD (50).

An important aspect of the therapeutic activities is strengthening the proactivity on the part of parents of

children with ASD and improving communication between them through movement. The options for practicing the so-called "joint dyadic movement parent-child (with ASD)" and their results have been studied in different directions - from arguments for choosing the most optimal activities and programs (29), to the influence of this type of activity on the stress level and quality of life of parents of children with ASD (1).

The purpose of this publication is to highlight the main aspects of nonverbal communication and its application to create a stronger lasting "parent-child" relationship and in the education of children with ASD.

MATERIALS AND METHODS

National and word databases of scientific publications such as NALIS Union Catalog, Elsevier, Scopus, Research gate were systematically searched using keywords related to "ASD", "children", "non verbal communication" etc. The more important results of the review related to the purpose of the study are systematized in several sub-points, at the end of each specific conclusions are summarized.

RESULTS

1. Symptoms of ASD - classification and development

Based on a series of studies by Lord et al. (1994) (34), Gotham et al. (2007) (20), Wiggins et al. (2015) (53) the following indicative classification of symptoms in ASD can be made:

1 Group: Communication and social symptoms. Includes:

- Language difficulties – most people on the autism spectrum have difficulty communicating with other people. This often becomes apparent in early childhood. All delays in speech development and non-verbal communication should be evaluated by a qualified professional.

- Eye contact and nonverbal communication – Poor eye contact and avoidance of eye contact are common symptoms among people with autism. Other non-verbal communication difficulties may include recognizing and using facial expressions, physical gestures and general body language.

- Tone of voice – Some people with autism may have difficulty regulating or modulating the tone of their voice. As a result, they may speak too loudly, too softly and/or in a monotone voice.

2. Group: Behavioral symptoms

- Repetitive behaviors – many people with autism may perform the same behavior repeatedly. This may include rocking, spinning or clapping their palms and arms, or flicking their fingers in front of their eyes. They may also play with toys or other objects in unusual ways, such as tirelessly spinning coins or plates and repeatedly pressing light switches.

- Ritual Behavior – This may include eating the same foods at every meal or watching the same videos over and over. They can even become quite upset soon after any slight change in plans.

- Self-injury – Some people on the autism spectrum hit their head on the ground or wall, bite their hands, or excessively rub or scratch their skin. There are many ways to treat these behaviors, including medical, sensory, nutritional, and behavioral approaches.

Bertilsson et al. (2022) (8) derive the following characteristic symptoms in ASD related to the general structure of movement quality: 1) reduced postural control; 2) deviant muscle tone and tension; 3) deviant sensory processing; 4) lack of conscious awareness; 5) difficulties with the limits of body movement; 6) coordination of movements (including breathing); 7) lack of preliminary preparation of movements; and 8) need for cognitive thoughts to control movements. According to the authors, the bodies and minds of people with ASD must constantly protect themselves from sensory impressions "from within" or from the environment, causing emotional stress and obscuring the meaning of their movements. Their body's reactions become restrained, choppy and hesitant.

Study Anderson et. al (2011) (5) examined trajectories of change in symptoms of irritability, hyperactivity, and social withdrawal, as well as predictors of such behaviors in youth aged 9–18 years with ASD and a control group with non-spectrum developmental delays. Children with more severe core features of autism had consistently higher irritability and hyperactivity scores over time than those with broader autism spectrum disorder and non-spectrum delays. Across all diagnoses, hyperactivity behaviors showed the greatest improvement. According to the authors, social withdrawal worsened with age for a significant proportion of youth with ASD, but not for those in the control group. Compared to youth without autism spectrum disorder, children with ASD showed greater heterogeneity in maladaptive behavior trajectories.

Gotham et al. (2015) (21) demonstrate that people with ASD are at particular risk for problems related to affect and anxiety. Although female symptom levels increase at a faster rate during adolescence, males with ASD appear to have elevated levels of depressive symptoms at school age that are maintained into young adulthood. Anxiety was most positively related to "verbal intelligence" and when low, both anxiety and depressive symptoms were greater in ASD than non-autistic study participants.

Conclusions:

1. With age, the ASD-symptoms change or are not as pronounced. 2. Knowing is not enough, understanding (interpreting) the symptoms (including movement patterns and emotional responses) of people with ASD is necessary, which can facilitate constructive interaction and communication, which has important implications for the design of therapeutic interventions.

2. Social difficulties in autism spectrum disorders

Autism spectrum disorders (ASD) are characterized by social and communication difficulties in everyday life, including problems in recognizing emotions. At the same time, affected individuals have a wide range of intellectual abilities and language skills. The majority of people with ASD have mild to moderate intellectual disability, but others demonstrate average to above average intelligence. Some of them have specific abilities in areas such as music, mathematics or memory that greatly exceed their general level of functioning (so-called autistic savants are known). Some people with ASD do not speak at all, while others express themselves verbally quite freely. The abilities of people with autism spectrum disorder vary widely. Some of them need help in their daily lives, while others can live and work with little or no support. (2)

ASD is characterized by impairments in social interaction (eg, social awareness, verbal and nonverbal communication) and repetitive, restricted behaviors, interests, or activities (eg, atypical movement, play and engagement with objects or subjects, atypical sensory behavior). Communication and interaction difficulties may include delayed language development or lack of spoken language and impairments in nonverbal communication such as limited eye contact, reduced facial expression and limited expressive gestures. In addition, people with autism often have difficulty processing non-literal and pragmatic elements of speech. Repetitive, stereotyped behaviors may include eye pressing, hand gliding, slight staring, and rocking (6). Repetitive, stereotyped behaviors may include eye pressing, hand sliding, slight staring, and rocking.

According to Weiss & Harris (2011) (52) the treatment of social skill deficits remains one of the most challenging areas in meeting the needs of people with autism. Difficulties in understanding social stimuli, in initiating and responding to social offers, and in assessing the effect inherent in social interactions can be confusing for people with autism. Uljarevic & Hamilton (2013) (51) consider that determining the integrity of emotion recognition in autism spectrum disorders is important for theoretical understanding of autism and for teaching social skills. The authors argue that the recognition of happiness is mostly successful in autism, and the recognition of fear is marginally more difficult than the recognition of happiness.

The ability to accurately perceive and interpret emotions from facial expression is fundamental to effective social communication according to Tanaka et al. (2012) (49), who found that patients with ASD generally have impairments in their ability to generalize facial emotions across identities and show a tendency to recognize facial features (eyes, lips) as isolated parts that cannot to connect in an overall expression.

Rogers (2003) (43) explored the potential that gesture analysis may have to help better understand the difficulties of children with specific language impairments and children with ASD. The study compared typically developing children, children with autism spectrum disorders, and children with specific language impairments regarding the use of gestures. Significant group differences were observed in the type and frequency of gesture use.

Conclusions:

Social difficulties in people with ASD generally come from the following reasons: 1. The behavior of people with ASD is in many cases, for most people with typical behavior, qualified as inappropriate, and they tend to put up barriers in communication and social closeness with people with ASD; 2. People with ASD have a problem with the perception of other people's emotions, which affects the empathic bond and hence the social one; 3. For a large part of people with ASD, abstract concepts (including those with a motivational charge) are incomprehensible and foreign - concepts such as "goal", "value", etc. 4. The issue of anxiety, which is to a greater extent in people with ASD and the relationship with socialization, is interesting. At this stage, it has not been proven that anxiety in ASD is due to fear of socialization, but on the contrary, their anxiety can affect their socialization.

3. Diagnosis of ASD and initiation of therapy

According to Daniels & Mandell (2014) (16), the diagnosis of autism is often delayed, resulting in a missed opportunity to provide therapy during a critical period of development. The authors found that the mean age at diagnosis for all autism spectrum disorders ranged from 38 to 120 months and decreased over time. Factors associated with earlier diagnosis included greater symptom severity, high socioeconomic status, and greater parental concern about initial symptoms. Family interactions with the health and education systems prior to diagnosis also influence age at diagnosis. Geographic variation in age at diagnosis of autism spectrum disorder also showed significant differences, suggesting that resources and government policies play a role in early identification of ASD. Early detection efforts should include increased education of parents and caregivers for early recognition of developmental problems, interventions aimed at streamlining the process from first concern to eventual diagnosis, and strategies targeting underserved populations.

May et al. al. (2021) (36) noted that children with a late diagnosis of ASD showed increasing trajectories of emotional and behavioral problems, whereas children with persistent or absent diagnoses showed decreasing trajectories. Between 86% and 74% of children studied by the authors had a reported diagnosis of ASD after 6 years. The findings show that children with ASD need services and supports that can adapt to their changing needs, which may be increasing, decreasing or simply different and sometimes difficult to fit into typical social care.

Hosozawa et al. (2020) (24) found that children with ASD are at increased risk for depression and self-injurious behavior, but whether timing of ASD diagnosis is associated with these outcomes in adolescence is

not yet well-studied. The authors found a linear relationship between the time of ASD diagnosis and depression and self-injurious behavior in adolescence. Later diagnosis of autism spectrum disorder, particularly diagnosis in adolescence, is associated with increased risk of depressive symptoms and self-injurious behavior in adolescence among children with ASD. According to the authors, interventions aimed at earlier diagnosis of ASD and approaches to improve person-environment fit may help prevent secondary mental health problems among people with ASD, especially among those without cognitive delays and as well the late diagnosed.

Conclusions:

Early diagnosis in ASD facilitates and increases the success of therapies. Awareness among people about the characteristics (symptoms, specific behavior) of ASD is important for its detection at an early age by family members or relatives.

4. Nonverbal communication in ASD

According to Iskrov et al. (2018) (26) the incidence of ASD has steadily increased over the past 30 years. The growing number of patients brings to the fore a number of medico-social issues and causes health, social and educational authorities to seek sustainable solutions to this problem. According to Kyriacou et al (2023) (31), autistic individuals have persistent differences in verbal and nonverbal communication, social interaction, restricted and repetitive patterns of behavior and interests, and abnormal responses to sensory stimuli from hyperreactivity to hyporeactivity. Leekam et al. (2007) (32) concluded that more than 90% of children and adults with autism have a sensory response that interferes with their daily lives, and their symptoms are consistent across age groups and IQ levels.

Sigman et al. (1999) (48) found that children with autism, regardless of their level of functioning, were less socially engaged with their classmates than other children with developmental disabilities (eg, those with Down syndrome and children with developmental delays) because they rarely initiated and accepted suggestions for play, not because they were rejected by their peers. Early nonverbal communication and play skills are predictors of peer engagement in children with autism. Based on the results of their study, the authors conclude that improvements in early communication and play skills can have long-term consequences for the later language and social competence of children with autism.

The results of an experimental study by Koegel et al. (2001) (30), showed that children with autism and their typically developing peers played with a comparable number of stimulus (eg, toys), but children with autism engaged in these activities for a shorter time. According to the authors' observations, both children with autism and their typically developing peers engage in similar levels of social interaction with adults. However, children with autism rarely or never engage in social interactions with their peers, whereas typically developing children often engage in social interactions with their peers.

According to Prevezer et al. (2009) (38) one of the main difficulties for children with autism is the development of communication and language, and the earlier this problem is addressed, the more effectively these skills can be improved. Children with autism face enormous difficulties when trying to interact with their typically (typically) developing peers. More children are educated in an integrated environment; however, play skills usually need to be explicitly taught, and the play environment must be carefully prepared to support effective social interactions.

The results of a study by Safira et al. (2020) (44) show that although children with ASD cannot interact clearly through verbal communication, they can express their wishes through nonverbal communication. Children can communicate nonverbally through facial expressions, eye contact, body movement, posture and touch. The meaning of nonverbal communication expressed by each child with ASD has a different interpretation, i.e. it is not possible at this stage to derive unified signs and codes.

A study by Alokla (2018) (3) aimed to determine how special education teachers implement evidence-based practices for nonverbal communication skills of children with ASD. The author interviewed six early childhood special education teachers from preschools in Southern California. According to the interviews with the teachers, the joint attention deficit in children with ASD was overcome with the help of visual aids, toys and basic gestures. Peer learning, functional communication training, and drawing have been found to improve nonverbal communication skills. In addition, children with ASD regularly play with their typically developing peers. The author concludes that the co-educational model can benefit children with ASD and also reduce the negative prejudice that typically developing children may have from their peers in special education classes.

A comparative study by Brignell et al. (2018) (13) on language development showed that children with ASD and those with language impairment produced similar mean language scores that were, on average, lower than typically developing children. The authors found that language progressed at a similar rate for all groups of children, with progress influenced by IQ and language ability rather than social communication skills or ASD diagnosis. Therefore, the verbal communication capabilities of the majority of children with ASD should not be underestimated.

Conclusions:

Communication (including nonverbal) between the therapist and the child with ASD is a two-way process that must be approached from the point of view of the child's current capabilities. Children with autism may have difficulty developing language skills and understanding what others say to them. They also often experience difficulties in nonverbal communication expressed most often in uncoordinated hand gestures, avoidance of eye contact and specific autonomous facial expressions. It is necessary for the therapy to pass through an attempt to interpret the specific behavioral manifestations, empathy, trust, to an attempt to enrich the nonverbal stock of the child with ASD with new

more conventional gestures and words, part of the social vocabulary, using mirror movements, mutual (complementary) games, dance, etc.

5. Stress in parents of children with ASD

After conducting review studies by Miodrag, Hodapp (2010) (35), Bonis (2016) (9), Bradley et al. (2023) (10) and others are adamant that increased stress among parents of youth with ASD is a fact and well documented. The daily life of these parents is completely subordinated to the care of their children. They must protect their child from running away (physically and mentally), handle crises, talk to their teachers about special education needs, avoid sights or sounds that overwhelm their children's senses, take them to therapists or doctors. Added to all this is sleep deprivation, as many autistic children have sleep problems and this reflects directly on their parents. Chronic stressors can deplete the body, especially the cardiovascular, immune, and gastrointestinal systems. Highly stressed parents also experience more mental health problems, including depression and anxiety. Many parents are so focused on their children's needs that they stop thinking about their own health. The reciprocal point is that parental stress affects children with ASD. The authors also report the so-called external factors to increase parental stress. Among them are the accusations of uninformed and malicious outsiders that the cause of the child's disorder is poor care in the family, the social isolation of families with ASD. The stress caused by financial difficulties should not be ignored. Parents of children with autism earn less — and work fewer hours — than people whose children have other health problems or no medical problems at all. Families may struggle to pay for therapies not covered by health insurance or provided by schools.

According to Osborne et al. (2008) (37) many parents have taken on, without training, the role of ASD 'therapists' at home as well. Research has found that highly stressed parents have more trouble following through on their children's behavior plans and implementing autism interventions, which isn't good for either side. Increased parental stress can lead to mental and physical fatigue, withdrawal, powerlessness, exhaustion and unwillingness to truly commit. Result, parent finding a pretext (eg new job for more money, etc.) for less time spent engaging with children in shared activities which generally results in reduced enjoyment by parents and children during shared interactions. Parents with elevated stress reported engaging in shared activities and experiencing synchronicity with their child less often than parents below the clinical threshold.

Conclusions:

Conducting therapies by specialists in various forms to parents of children with ASD in order to improve the possibilities, usefulness and enjoyment of shared activities between parents and children with ASD will reduce the stress of these parents.

6. Specificity of communication between children with ASD and their parents

Shattuck et al. (2009) (46) consider that there is too much of a gap between the age at which children with ASD can be identified and when they are actually

identified (according to the authors this occurs when children are 5-7 years of age), suggesting a critical a need for further research, innovation and improvement in this area of clinical practice, including parent education and awareness raising. Brignell et al. (2017) (12) in turn emphasize the importance of the time when parents begin to feel the first signs of loss of communication with the child with ASD. The authors compared the loss of communication in 7-year-old children later diagnosed with autism spectrum disorder, those with language impairment, and children with typical language development. Communication tools completed by parents were used. As a group, children with autism spectrum disorder showed slower average skill acquisition, with an increasing difference between trajectories, compared to children with typical development and language impairment. Part of all groups have lost skills in at least one area (from children with ASD - 41%, children with language impairment - 30%, those with typical development - 26%). Compared to the other two groups, the most children from the group with ASD have lost skills in more than one domain (autism spectrum disorder (47%), language impairment (15%), typical development (16%). Loss was most common for all groups in the domain of 'emotion and eye gaze "but at a higher rate in children with ASD. A greater proportion of children with ASD also lost skills in gestures, sounds, and comprehension compared to children with typical development but not language impairment. According to the authors, these findings add to the understanding of early communication development and emphasize that the loss is not unique to ASD.

Conclusions:

In order to more successfully support the socialization processes of children with ASD, it is necessary:

1. To lower the threshold of the time of their diagnosis;
2. Detection and reaction at the first signs of loss of communication between the child and the parents.
3. Loss of communication is not unique to ASD.

7. Basic approaches to teaching children with ASD

7.1. Learning through games

Play is critical to young children's development and is an important part of their daily lives, however, according to Jung & Sainato (2012) (27), children with autism often exhibit deficits in play skills and engage in stereotyped behaviors. The authors review studies to identify effective instructional strategies for teaching play skills to young children with autism. As a result, they implemented combined interventions involving alternating individual and group play, as a result of which, according to the authors, children with autism improved their play skills, increased positive social interactions and reduced inappropriate side effects. Six main types of play have been identified, which are applied in different sequences or in combination:

- *exploratory play*- in this game, children's interest is directed towards making the objects or phenomena, instead of playing with them (e.g. touching water, stuffed toy, hot and cold cup, etc.)

- *cause-and-effect play* - children play with toys that need an action to get a result - for example, pressing a button to play music or a drive. This type of play

teaches children that their actions have an effect and gives them a sense of control in the game.

- *toy play* - toy play is teaching children how to play and use toys in the way they are designed - for example pushing a toy car, holding a toy phone to the ear or throwing a ball.

- *constructive game* - in it, children build or arrange things. It involves working towards a goal or product - for example, completing a puzzle, building a tower of cubes, or painting a picture.

- *physical play*- it is related to physical insults and activities of a competitive sports nature. This type of play helps the child develop gross motor skills and supports their body. These types of games provide a chance for the child to explore the environment and interact with other people.

Yanardag et al. (2013) (55) recommended water play as preferred by children with autism and as a means of expanding the knowledge, skills and motor development of these children.

7.2. Learning through videomovies

Riby, Hancock (2009) (41) conducted a comparative study in which they assumed that autism and Williams syndrome (WS) are neurodevelopmental disorders associated with different social phenotypes. While individuals with autism show a lack of interest in socially relevant cues, individuals with SU often show increased interest in socially relevant information. The authors used eye-tracking to investigate how people with WS and autism prefer to watch social scenes and excerpts from movies containing human actors and cartoon characters. The proportion of gaze time spent fixating on faces, bodies, and the screen background was investigated. The results showed that while individuals with autism preferred to pay attention to the characters' faces for less time than usual, people with WS paid attention to the same images for longer than usual. For individuals with autism, the atypical gaze behavior extended to human actors and cartoon images or movies, whereas for those with WS, the atypicalities were limited to human actors.

Kagohara (2010) (28) reviewed intervention studies on the use of video-based instruction to teach adaptive behavior to children with ASD. The conclusions of her study are that, in general, this method has a positive impact on children and helps to some extent to improve their skills.

A study by Carter et al. (2014) (14) compared the responsiveness of children with autism to computer-generated or animated characters and their responsiveness to humans. Twelve 4- to 8-year-old children with autism interacted with a human therapist; a human-controlled interactive avatar in a theme park; a human actor speaking as the avatar; and cartoon characters seeking social answers. The authors found a high level of therapist gestural and verbal responses; intermediate levels of response to avatar and actor; and weakest responses to cartoon characters, even though attention was equivalent across conditions. According to the authors, these results suggest that even avatars that provide lively, responsive interactions are not superior to human therapists in eliciting verbal and nonverbal communication from children with autism in this age group.

The results of a study by Cross et al. (2022) (15) shows the benefits of watching cartoons by children with autism. The authors found that while people with autism may demonstrate poorer recognition of facial emotions when the stimuli are human, these differences are reduced when the stimuli are anthropomorphic. That is, the emotions and actions of the drawn characters are more easily recognized by children with autism. At this stage, for a better deterrence of cartoons, it is recommended that there be less negative stimulation in them (intense scenes with sharp and loud noises, bright, flashing colors and rapidly changing images), that the characters speak in calm voices, the messages to be positive focused on community, friendship and family.

7.3. Teaching children with ASD through their peers with typical behavior

The above-described approaches (7.1 and 7.2.) of teaching children with ASD are mainly applied by their teachers or parents/family members. Studies by Harper et al. (2008) (22) and Alshurman & Alsreaa (2015) (4) found that after implementing a nonverbal communication training program for children with autism by their peer mediators instead of a classical teacher, the same two months after its termination they retained the skills they had been on trained, including shared attention, visual communication, imitation, listening and understanding, indicating what they need, understanding facial expressions and tone of voice. According to the authors, the results of the studies provide a positive direction for "peer training" in nonverbal communication of children with ASD and creation of an effective and continuous communication approach between them and the teacher. Imitation skills, easier identification of favorite visual stimulus, serve as additional motivation for the child with ASD.

7.4. Learning through art

Different types of art offer a wide variety of non-verbal communication and expressive tools for children with ASD. According to Emery (2004) (18), art therapy allows children with ASD to engage in a nonverbal form of self-expression that can convey their experiences in a non-threatening way, as it does not require the use of words, which is often difficult for children with an autistic disorder. Epp (2008) (19) considers that art-based interventions activate the senses of sight, hearing, touch and smell. In addition, art therapists use different materials with different colors and textures. They can be used as a means of sensory regulation for the child. Activities can be tailored to individual clients in a way that gives them a sense of security.

Quintin (2019) (39) reviews research findings showing that music is a significant factor in assessing perception, reward, emotion and related physiological responses and neural circuits in individuals with ASD. People with ASD are greatly affected by music, including pitch perception, musical memory, and identification of music-evoked emotions. Listening to music activates neural circuits of reward and emotional response. The author argues that adults with ASD also activate these systems when listening to music, although there may be developmental differences in the physiological and neural response to music in child-

hood and adolescence, along with the typical behavioral response. The outcome of this review study supports the use of music therapy and education for people with ASD, specifically to improve social skills and communication. Taken together, the reviewed findings provide evidence for music as a strength-based approach in ASD cases to assess reward and emotional response and as a powerful intervention tool.

A study by Rahimi-Pordanjani (2021) (40) shows that the so-called drama therapy (therapy through theater) effectively affects the social skills of children with high functioning autism. Using extensive practice examples with a range of client groups, Haythorne, Seymour (2017) (23) challenge the notion that people with autism are unable to function within the metaphorical realms of imagination and creativity. Their study demonstrates that people with ASD are capable of engaging effectively in creative inquiry and by encountering these processes in the clinical context of drama therapy, life-enhancing changes can be made.

According to Roberts (2018) (42), psychotherapists who use the parent-child model when working with children with ASD describe an improvement in communication and in the relationship between children and parents with the help of art therapy (music, drawing, dance, role-playing). They also observed an improvement in the children's ability to engage in symbolic play, in the way the children felt they were understood, and in terms of their parents' support.

A study by Liu et al. (2021) (33) showed that the combination of an applied behavior analytic intervention with parent-child drawing and creative crafting therapy could more effectively improve the core symptoms and social interaction of preschool children with mild to moderate ASD, reduce mothers' parenting stress and improve their level of hope.

Very popular among art therapies for children with ASD is "sand therapy" (also called "sand play therapy"). According to Bradway (2006) (11), it is a combination of play and art therapy, where the therapist uses a box filled with sand, and the client is provided with miniature toys to create their own imaginary world in the sand itself. Toys can be the most diverse - from domestic animals and dinosaurs to trees, flowers, houses and cars - artifacts of real life. The customer is free to choose which toys to use, then he himself arranges them in the tray/box. The therapist plays the role of observer and rarely interrupts the client, letting him recreate a world that reveals his inner struggles or conflicts. After the sand play is over, the therapist and client often discuss what they observed—the particular choice of toys, the way they were arranged, and the hidden meaning or symbolism within them. The basic idea is that if the therapist provides the client with a safe space, they will use the sandbox to find solutions to their problems on their own. According to studies, sand therapy reduces symptoms of various types of mental illnesses or disorders and increases resilience.

Conclusions:

In all these, albeit diverse, approaches to learning, several common and important features stand out: 1. Reciprocity in activities - the child with ASD must feel the care and special attention and attitude towards him;

2. Encouragement to creativity, stimulation and integration of personal skills; 3. Absence of stress factors and the therapist's desire to build an environment and relationships with an atmosphere of calm and safety. 4. Nonverbal communication is the basis of each of the learning approaches. 5. The listed approaches can be applied in an integrated manner.

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TECHNICAL SCIENCES

SYNTHESIS OF THE LOAD MOMENT OBSERVER IN ASYNCHRONOUS ELECTRIC DRIVE

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Abstract

The paper solves an actual scientific problem, which consists in the application of the modal control method for the synthesis of a modal observer the state of the active power channel of an asynchronous machine (AM) in the system of its vector control by the stator. The main task of the observer is to identify the moment of static load on the shaft AM in order to use this information in the extreme control circuit of the asynchronous electric drive. The asymptotic stability and sufficient accuracy of the observer of the moment of static load on the shaft AM to determine the coordinates of the minimum of the quality functions of the extreme control the asynchronous machine, which improves its energy indicators, has been proven by the method of mathematical modeling.

Keywords: Asynchronous machine, vector control, modal load moment observer, asymptotic stability, distribution of polynomial roots.

Introduction. The structure of the vector control system of the asynchronous machine with constant flow can be irrational, because stabilization system control of flow at the level of nominal value leads to a decrease in the power factor at the of loading of the electric drive less than the nominal. This disadvantage is inherent in adjustable electric drives of loading machines with a fan mechanical characteristic. Analytical expressions that allow to determine the value of the flow of asynchronous electric drive (ED), in which its energy characteristics reach the extremum obtained in [1,2]. Improve the energy indicators of the asynchronous electric drive with stator control is possible by changing the flow of rotor in the function of loading on the shaft of the asynchronous machine (AM) [3]. In order to optimize energy processes in such an electric drive, it is necessary to construct a two-channel system with independent control of the speed and flow of the AM rotor, which can be implemented in the vector control system with the addition of the circuit of extreme regulation in its composition. The purpose of regulation is to achieve the extremum of some function of a goal that describes the energy characteristics of AM [3].

Analysis of recent research and publications. The need to calculate the load moment on the shaft of an electric machine arises in electric drives for various purposes. Currently, there are a number of approaches to estimating the load moment in an electric drive. The classic solution is to estimate the load moment by the armature current of the electric drive [4]. In fact, this question consists in an indirect assessment of the electromagnetic moment and is used only in the stable mode of operation ED. To determine the position of the kinematic links, the assessment of deformation shifts in the hinges under the influence of the load moments fixed in the electric drives can be used. This task is relevant for robotic systems that have high requirements

for dynamic accuracy. Papers [5,6] implement an approach in which the load moment is estimated based on the difference between two values of the speed electric drive: measured and restored by the observer. In this approach, the estimation of the load moment is performed indirectly through the estimation of the speed, and the quality of the estimation depends on the knowledge of the parameters electric drive model. The state vector of an asynchronous machine can be estimated using the Luenberger observer [7] or the extended Kalman filter algorithm [8]. Another approach is presented in works [9,10], where the restoration of the load moment is performed according to the data of the electromagnetic moment and the acceleration of the motor shaft, which directly follows from the equation of motion of the ED. However, the measurement of acceleration or its estimation often causes difficulties related to the probability and presence of noise in the measured signal. To restore the acceleration signal, it is possible to use a speed observer [11]. In the article [12], astatic speed regulation is proposed, which is implemented using the principle of combined control with positive feedback on the disturbance, as a corrective signal of the estimation of the static load moment. In [13], an observer with a sliding mode was synthesized, which asymptotically estimates the unknown load moment and determines the moment inertia of an ED based on a synchronous motor with permanent magnets. The paper [14] presents the method synthesis of the observer of mechanical speed and load moment in high-speed asynchronous ED of rolling stock. Such an observer is used for the purpose of diagnosing speed and torque sensors and ensures the operation of the ED in the event a malfunction of the physical sensors.

Formulation of the purpose research. From the analysis of the latest research and publications, it follows that the energy characteristics of asynchronous

ED in steady-state operation are functions of three variables: the angular speed of rotor rotation, the modulus of the rotor flux coupling vector, and the moment of static load. The angular velocity of the rotor and the flow coupling are among the state variables of AM and they are subject to measurement. The moment of static load is an external disturbing influence, effective methods of its measurement are not available. If, in order to improve the energy indicators of the AM, it is necessary to adjust its reactive power depending on the moment of load on the shaft, then it is necessary to synthesize an observer that would determine the estimate of the moment load on the shaft AM in the process of regulation and operation of the ED. Information about the moment of load on the shaft of an asynchronous machine is required for the implementation of extreme control circuits as part of vector control systems for asynchronous electric drives. In [3] a modal observer of the load moment is proposed, which works in the circuit of extreme regulation by the electric drive of the fan, in which the load moment changes smoothly as a function of speed. However, the properties of the observer during jump-like changes in the load at different rotation speeds of the rotor AM were not studied in detail. Therefore, in this work, the task is to apply the method of synthesis modal observers to build and study the mathematical model of the observer state variables of the active power channel and the load moment on the shaft of an asynchronous ED with vector control.

Presenting main material. The starting points for the synthesis of the observer are the AM equations in the Cauchy form, written in the coordinate axes oriented along the rotor flux coupling vector [2]:

$$\begin{aligned} p\Psi_r &= -\frac{\Psi_r}{T_r} + \frac{L_m}{T_r} I_{su}; \\ pI_{su} &= -\frac{R'_s}{L'_s} I_{su} + \frac{K_r}{T_r L'_s} \Psi_r + N\omega_r I_{sv} + K_r R_r \frac{I_{sv}^2}{\Psi_r} + \frac{U_{su}}{L'_s}; \\ p\omega_r &= \frac{3NK_r \Psi_r}{2J} I_{sv} - \frac{M_s}{J}; \\ pI_{sv} &= -\frac{R'_s}{L'_s} I_{sv} - \frac{K_r N \Psi_r}{L'_s} \omega_r - N\omega_r I_{su} - K_r R_r \frac{I_{su} I_{sv}}{\Psi_r} + \frac{U_{sv}}{L'_s} \end{aligned} \quad (1)$$

As can be seen from equations (1), AM is a multi-connected system, as it is characterized by non-linear connections between control channels and non-linear dependencies between controlled variables. Each adjustable value can be matched with its own regulator and thereby determine the direct influence transmission channels in the control object. Analysis of the system of equations (1) shows that AM as an object of regulation consists of two interdependent circuits. The connection between the active and reactive power control loops is due to four internal cross-connections in the AM: two cross-connections due to the dissipation fluxes $L'_s \omega_r I_{su}$, $L'_s \omega_r I_{sv}$, cross-connection due to the EMF of rotation $K_r \omega_r \Psi_r$ and cross-connection due to the electromagnetic moment $\frac{3}{2} NK_r \Psi_r I_{sv}$. Stabilization of the rotor flux coupling vector module

unambiguously determines the dependence of the electromagnetic moment AM on the active component of the stator current I_{sv} and at the same time linearizes the links of the formation of the electromagnetic moment and feedback on the EMF of the motor. Cross-connections due to dissipation flows are considered as disturbing effects in the control channels of the active and reactive powers of the AM.

It is necessary to enter the value of the static moment M_s into the extreme control circuit, since the expressions of the objective functions come from the equations of the steady state operation of the electric drive, in which the electromagnetic moment is equal to the moment of the static load. However, the moment of static load on the AM shaft cannot be measured by instrumentation. In addition, for the implementation of the relay speed regulator, it is necessary to organize feedback on its first derivative. Direct differentiation of the signal from the output of the speed sensor, which inevitably contains a high-frequency component of interference, is associated with great technical difficulties. In order to solve the mentioned problems that arise during the technical implementation of the extreme control system AM, it is necessary to use an observer that identifies not only the variables of the state of the control object, but also the external influences that cannot be directly measured.

The state observer is built on the basis of the known structure and parameters of the linear object. The initial values of the state vectors of the control object and the observer must be the same, and the input influences are applied simultaneously to the real object and to the observer. The subsystem that describes the dynamic processes in the control channel of the active component of the stator current AM consists of the third and fourth equations of system (1), which are written separately and have the form:

$$\begin{aligned} p\omega_r &= \frac{3NK_r \Psi_r}{2J} I_{sv} - \frac{M_s}{J}; \\ pI_{sv} &= -\frac{K_r N \Psi_r}{L'_s} \omega_r - \frac{R'_s}{L'_s} I_{sv} + \frac{U_{sv}}{L'_s} - \frac{U_{pr}}{L'_s}, \end{aligned} \quad (2)$$

where U_{sv} – active component of the stator voltage; $U_{pr} = \left(\frac{R_r K_r I_{sv} I_{su}}{\Psi_r} + N\omega_r I_{su} \right) L'_s$ – cross-talk signal; M_s – moment of static load on the shaft.

For the active power channel model AM (2), the variables U_{sv}, U_{pr} serve as input signals, and the quantity M_s – serves as a disturbing influence. Then the characteristic equation of the object (2) will be determined as follows

$$\begin{vmatrix} p & -\frac{3NK_r \Psi_r}{2J} \\ \frac{NK_r \Psi_r}{L'_s} & p + \frac{R'_s}{L'_s} \end{vmatrix} = p^2 + \frac{R'_s}{L'_s} p + \frac{3N^2 K_r^2 \Psi_r^2}{2J L'_s}. \quad (3)$$

When forming the state vector, we introduce the

notation $x_1 = \omega_r$, $x_2 = I_{sv}$. Since the load torque disturbance M_s cannot be measured and entered into the monitoring device, it is considered as one of the state variables $x_3 = M_s$ of the control object extended in this way. If the working mechanism has a fan mechanical characteristic, then it is always possible to write its analytical expression in the following form, at least approximately

$$M_s = M_0 + (M_{sn} - M_0)(\omega_r / \omega_{rn})^2, \quad (4)$$

where M_s – moment of resistance of the production mechanism at speed ω_r ; M_0 – moment of friction in moving parts; M_{sn} – moment of resistance of the mechanism at the nominal speed of rotation ω_{rn} .

Differentiating (4) by time using the first expression of system (2), we obtain the following equation,

$$X = \begin{pmatrix} \omega_r \\ I_{sv} \\ M_s \end{pmatrix}; U = \begin{pmatrix} U_{sv} \\ U_{pr} \end{pmatrix}; A = \begin{pmatrix} 0 & \frac{3NK_r\Psi_r}{2J} & -\frac{1}{J} \\ -\frac{NK_r\Psi_r}{L'_s} & -\frac{R'}{L'_s} & 0 \\ 0 & \frac{3NK_r\Psi_r b}{2J} & -\frac{b}{J} \end{pmatrix}; B = \begin{pmatrix} 0 & 0 \\ \frac{1}{L'_s} & -\frac{1}{L'_s} \\ 0 & 0 \end{pmatrix};$$

$$Y = I_{sv}; C = \begin{pmatrix} 0 & 1 & 0 \end{pmatrix}.$$

The rank of the observation matrix $Q = [C^T : A^T C^T : (A^T)^2 C^T]$ is equal to the order of system (6) $n = 3$, that is, the extended object is fully observed and the task of estimating its state has a solution.

The observing device is described by the equation

$$p\hat{X} = (A - KC)\hat{X} + BU + KY, \quad (7)$$

$$\det[pI - (A - KC)] = \begin{vmatrix} p & -\frac{3NK_r\Psi_r}{2J} + k_1 & \frac{1}{J} \\ \frac{NK_r\Psi_r}{L'_s} & p + \frac{R'}{L'_s} + k_2 & 0 \\ 0 & -\frac{3NK_r\Psi_r b}{2J} + k_3 & p + \frac{b}{J} \end{vmatrix} = p^3 + \left(\frac{R'}{L'_s} + \frac{b}{J} + k_2 \right) p^2 + \left(\frac{3N^2 K_r^2 \Psi_r^2}{2JL'_s} - \frac{NK_r\Psi_r k_1}{L'_s} + \frac{bR'}{JL'_s} + \frac{bk_2}{J} \right) p + \frac{NK_r\Psi_r k_3}{JL'_s} - \frac{NK_r\Psi_r bk_1}{JL'_s}. \quad (8)$$

To give the observer the desired dynamic properties, let's assume the standard polynomial form of the distribution of the roots characteristic equation of the third order

$$D(p) = p^3 + A_1 \Omega_0 p^2 + A_2 \Omega_0^2 p + \Omega_0^3, \quad (9)$$

where Ω_0 – mean geometric root of the characteristic equation of the observing device.

which relates the external influence M_C to the state variables of the object (2):

$$pM_s = -\frac{3NK_r\Psi_r b}{2J} I_{sv} - \frac{b}{J} M_s, \quad (5)$$

$$\text{where } b = \frac{2(M_{sn} - M_0) \omega_r}{\omega_{rn}^2} \text{ – coefficient,}$$

which varies in proportion to the speed rotation of the rotor.

If expression (5) is added to system (2), then the dynamics equation of the extended control object in vector-matrix form will have the form

$$\begin{aligned} pX &= AX + BU; \\ Y &= CX, \end{aligned} \quad (6)$$

where X – object state vector; U – vector of measured input influences; A and B – state and input matrices; Y – vector of measured output variables and output matrix C , are found as:

where $\hat{X}$ – the state vector of the object restored by the observer; K – the vector of the coefficients of the observer's correction relations.

The selection of the elements of the modal feedback vector $K = (k_1 \ k_2 \ k_3)^T$ means the task of a certain form of the characteristic equation of the observer, which is written in the following way

The coefficients A_1 and A_2 determine the location of the roots characteristic equation of the observer on the complex plane. For distribution according to Butterworth we have $A_1 = A_2 = 2$, according to Newton – $A_1 = A_2 = 3$. From the comparison of the coefficients with the same powers of the operator p in

equations (8) and (9), there are analytical expressions for the coefficients K of the observer feedback vector:

$$\begin{aligned} k_2 &= A_1 \Omega_0 - \frac{R'}{L_s} - \frac{b}{J}; \\ k_1 &= \frac{3NK_r \Psi_r}{2J} + \frac{bR'}{JNK_r \Psi_r} + \frac{bL_s k_2}{JNK_r \Psi_r} - \frac{A_2 \Omega_0^2 L_s}{NK_r \Psi_r}; (10) \\ k_3 &= bk_1 + \frac{\Omega_0^3 J L_s}{NK_r \Psi_r}. \end{aligned}$$

After transforming the matrix equation of the observer (7), we obtain the equation

$$p\hat{X} = A\hat{X} + K(Y - C\hat{X}) + BU, \quad (11)$$

which for each coordinate is written separately as follows:

$$\begin{aligned} p\hat{\omega}_r &= \frac{3NK_r \Psi_r}{2J} \hat{I}_{sv} - \frac{\hat{M}_s}{J} + k_1(I_{sv} - \hat{I}_{sv}); \\ p\hat{I}_{sv} &= -\frac{NK_r \Psi_r}{L_s} \hat{\omega}_r - \frac{R'}{L_s} \hat{I}_{sv} + k_2(I_{sv} - \hat{I}_{sv}) + \frac{U_{sv}}{L_s} - \frac{U_{pr}}{L_s}; (12) \\ p\hat{M}_s &= \frac{3NK_r \Psi_r b}{2J} \hat{I}_{sv} - \frac{b}{J} \hat{M}_s + k_3(I_{sv} - \hat{I}_{sv}). \end{aligned}$$

System (12) determines the structure of the observer and its work algorithm. The control object is always affected by disturbances that cannot be measured and entered into the observer, and there may also be some discrepancy between the mathematical description of the control object and the observer. Therefore, it is recommended to choose Ω_0 such that the speed of the observer is slightly higher than the speed of the system that contains the observer in the feedback loop. Object speed control is determined by its average geometric root, which is found by the formula

$$\Omega_{ob} = \sqrt{\frac{a_2}{a_0}} = NK_r \Psi_r \sqrt{\frac{3}{2JL_s}}, \quad (13)$$

where a_0 and a_2 – coefficients at p^2 and p^0 characteristic equation (3), and it is accepted $\Omega_0 = (2..3)\Omega_{ob}$ [15].

The structural diagram of the observer, compiled according to the system of equations (12), is shown in Figure 1. To correct the values of the current variables of the observer of the load moment, the active component of the stator current I_{sv} is monitored, which is compared with a similar variable calculated by the observer $\hat{I}_{sv}$. Their difference through corrective feedback blocks (k_1, k_2, k_3) is applied to the inputs of the observer's integrators.

When the values of the control object's state variables and their estimates differ, the observer's corrective circuit works because a current identification error appears I_{sv} . The external influence U_{sv} is measured and fed to the input of the observer.

In order to simplify the structure of the observer, when determining the cross-connection signal due to dissipation currents U_{pr} , the stator current I_{sv} is replaced by its estimate $\hat{I}_{sv}$, and instead of dividing by the modulus of the rotor flux Ψ_r , its nominal value is taken Ψ_{rn} . In the

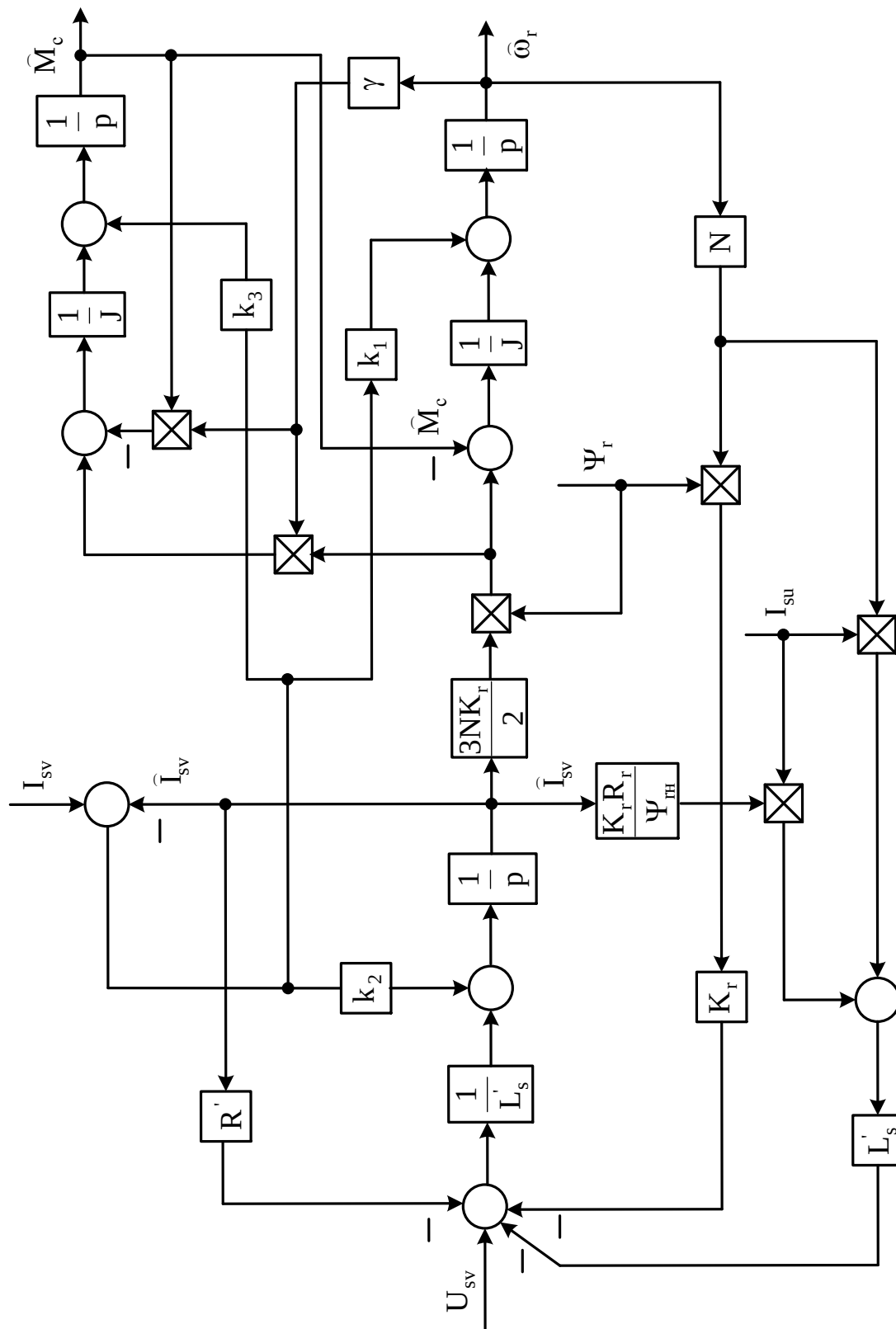


Fig. 1. Structural diagram of the status observer of the active power channel of an asynchronous machine

expression for the coefficient b , instead of the speed of rotation rotor, its estimated value $\hat{\omega}_r$ is used, and the coefficient is $\gamma = 2(M_{sn} - M_0)/\omega_{rn}^2$.

As can be seen from formulas (10), the coefficients of the connections k_1, k_2, k_3 , which adjust the observer to the control object, depend on Ω_0 and

change as a function of the rotor flow and the estimation of its rotation speed. Dynamic errors in the estimation of state variables of the control object will be smaller, the larger the value Ω_0 . However, the possibilities of the increase Ω_0 are limited, because it causes the growth of the coefficients vector K , which will lead to oscillations and further to the loss of stability of the control system closed through the observer.

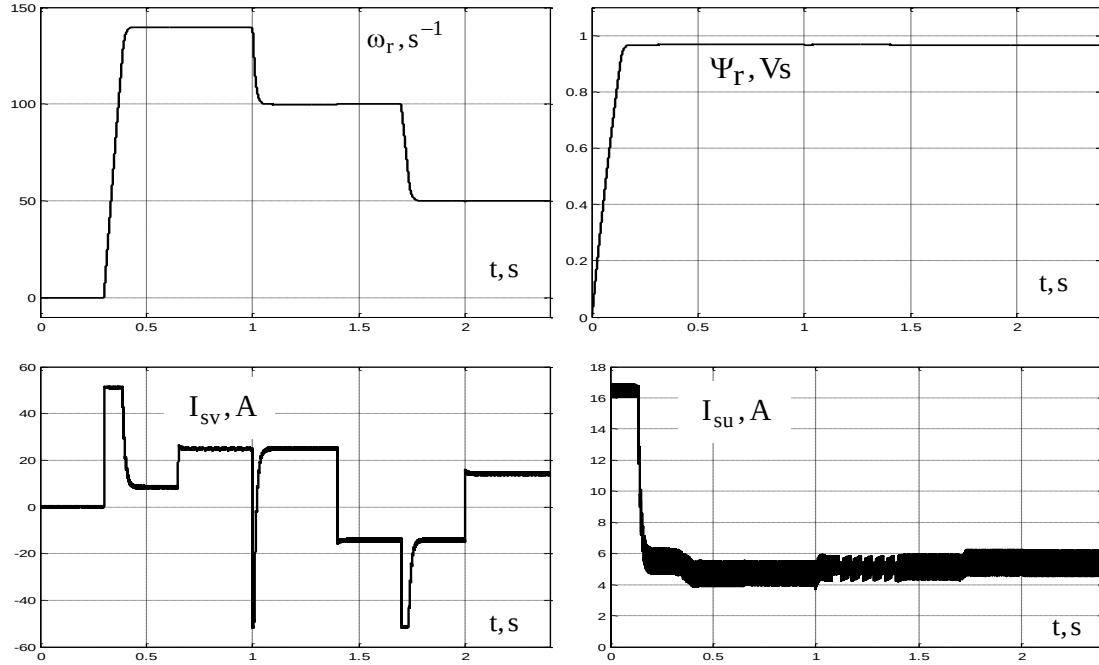


Fig. 2. State variables of an asynchronous electric drive with a vector control and observer of the load moment AM

The dynamics of the load moment observer applied to the shaft of an asynchronous electric drive with a vector control system is investigated using a mathematical model created in Matlab/Simulink. The electric drive is made on the basis of an asynchronous machine type 4A132M4Y3 with the following technical data: $P_n = 11 \text{ kW}$; $U_{sl} = 380 \text{ V}$; $n_n = 1460 \text{ rpm}$. Figures 2 and 3 show transient processes: Figure 2 shows the state variables of the ED, and Figure 3 shows the load moment on the shaft AM as a disturbing influence acting on the ED and its estimate, which is calculated by the synthesized observer. From the graphs in Figure 2, it can be seen that the relay-vector control system works out different levels of speed stabilization at different moments of load on the shaft AM, which is done to test the dynamic properties of the observer when he evaluates moments of load that jump change at different speeds. The graphs in Figure 2 show the excitation of the AM with a stationary rotor by increasing the module of the rotor flux coupling vector to its nominal value and stabilizing it at this level in all subsequent operating modes by the appropriate relay regulator in the reactive power channel. At the same time, the relay regulator of the reactive component of the stator current I_{su} is subordinate to the regulator of the rotor flux coupling vector module Ψ_r .

After stabilizing the rotor flux coupling at the nominal level, the acceleration process begins by adjusting the active power channel. The structure of the active power channel is determined by subordination to the relay regulator of the speed rotation of the rotor ω_r of the regulator of the active component stator current I_{sv} . Stabilization of the dynamic moment occurs by the regulator of the active component of the stator current I_{sv} by limiting its value in transient processes. As the speed increases, the moment of load on the shaft AM increases, which is monitored by the observer of the state of the active power channel as a result of the real-time solution of the system of equations (12). Figure 3A shows the dynamics of the load observer during the distribution of the roots of the characteristic polynomial according to Butterworth, and Figure 3B shows the calculated transient processes in the observer during the distribution of the roots of its characteristic equation according to the Newton binomial. At moments of time 0.65s, 1.4s and 2s, load moments of different signs are added to the shaft AM. These actual values of the load moment on the shaft AM are shown in Figure 3 by the blue line. The red line (number 1) represents the transient processes of the observer's calculation of the state of disturbance along the load moment channel. From the comparison of the graphs marked with the number

1 in Figure 3, it can be seen that when working out the disturbance along the load channel by the moment observer with the distribution of roots according to Butterworth, a small over-regulation occurs, while there

are no over-regulations when the roots are distributed according to the Newton binomial. All load additions were carried out at

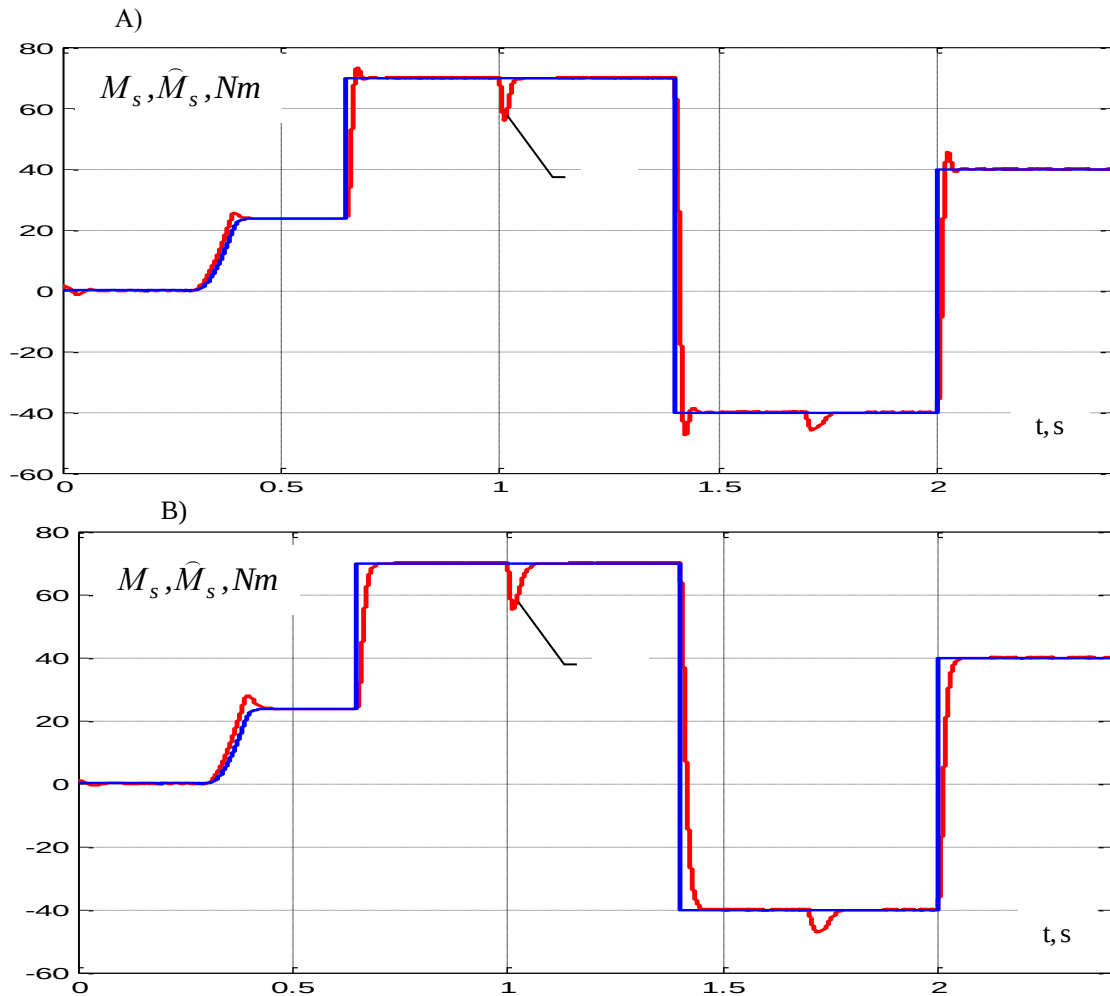


Fig. 3. The estimation signal of the static load moment at the observer's output (red graph, number 1) and the actual load moment on the shaft of the asynchronous machine (blue graph): A – distribution of the roots characteristic polynomial of the observer according to Butterworth; B – distribution of the roots characteristic polynomial of the observer according to the Newton binomial

stabilized rotor speeds. The quality of the observer's assessment of the load moment does not depend on the level of speed stabilization. However, the adjustment coefficients k_1, k_2, k_3 of the observer through the coefficient b (formula (10)) depend on the speed of the rotor AM. Therefore, when the transient processes of rotor speed regulation begin in the active power channel at time points 1s and 1.7s, short-term dynamic errors in the observer's assessment of the load moment appear. Further, the errors of estimating the load moment go to zero due to the fact that the change of coefficients k_1, k_2, k_3 during speed regulation does not violate the asymptotic stability of the observer. Moreover, the coefficients k_1, k_2, k_3 in the function of speed change in such a way that the distribution of the

roots characteristic equation of the observer, given by the coefficients A_1 and A_2 , also does not change at different speeds of rotation of the rotor. This is confirmed by the same form of the transient process of load moment estimation at different levels of rotor speed stabilization. The observer presented in Figure 1 also allows to estimate the rotor speed and its first derivative.

Conclusions. In this work, the problem synthesis of a modal observer of the state of the active power channel of an asynchronous electric drive with vector control for identifying the moment of load on the shaft of an asynchronous machine is solved. The dynamics of the load moment observer at different speeds of the rotor AM and the jump-like changes of the load moment on its shaft were investigated using a mathematical model. Due to the speed dependence of expressions

(10) for determining the elements of the modal feedback vector K , the obtained observer (10), (12) can be considered nonlinear. However, the elements of the corrective feedback vector K are changed in such a way that the load moment observer keeps the transient characteristics given by the standard polynomial forms at different levels of speed stabilization unchanged.

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ДРОНИ В ГІРНИЧОДОБУВНІЙ ПРОМИСЛОВOSTІ

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<https://doi.org/10.5281/zenodo.10515165>**Abstract**

Unmanned aerial vehicles (UAVs) are becoming more and more commonplace in our lives. The use of UAVs in many industries where they are capable of performing complex tasks has become relevant. An important industry is mining, which requires constant monitoring of the correct and complete development of deposits, occupational safety, hazardous emissions, etc. New technologies based on the use of UAVs can solve these problems.

The article analyzes the possibilities of using UAVs in the mining industry based on the analysis of existing research.

Анотація

Безпілотні літальні апарати (БПЛА) все більше входять у наше життя. Актуальним стало використання БПЛА у багатьох галузях промисловості, де вони здатні виконувати складні завдання. Важлива галузь – гірничодобувна потребує постійного контролю за правильним і повним відпрацюванням покладів, безпекою праці, небезпечними викидами, тощо. Вирішити ці проблеми можуть нові технології, які базуються на використанні БПЛА.

У статті проаналізовано можливості використання БПЛА у гірничодобувній промисловості на основі аналізу чинних досліджень.

Keywords: unmanned aerial vehicle, mining industry, analysis.

Ключові слова: безпілотний літальний апарат, гірничодобувна галузь, аналіз.

Значний перелік виробничих процесів потребує використання та аналізу просторових даних. Залежно від поставлених задач у якості таких даних використовуються результати дистанційного зондування Землі, що є продуктом обробки зображень поверхні. Такі дані достатньо високої якості отримують із застосуванням технології дистанційного зондування, що базуються на використанні повітряних засобів – безпілотних літальних апаратів (БЛА).

Сьогодні безпілотні технології – вже не фантастика. Вони міцно увійшли до нашого життя. Особливо часто їх застосовують у випадках, коли необхідно провести обстеження досить великих ділянок зі складним рельєфом у досить короткі терміни.

Застосування БПЛА дозволяє компаніям економити не лише час, але й позбавляє їх від великих

фінансових витрат. Всі ці фактори призвели до того, що ряд великих світових гірничодобувних компаній розпочав активне впровадження БПЛА у технологічні процеси.

Аналіз чинних наукових досліджень доводить значний інтерес вчених до проблеми застосування БПЛА в гірничій промисловості.

Згідно [1] запровадження цифрових технологій у вугільних компаніях є об'єктивною необхідністю. Зараз вугільна галузь перебуває на новому етапі цифрової трансформації.

Rathore, I., Kumar, N. P. [2] вивчали можливість та подальші напрямки розвитку технології БПЛА. Зокрема у гірничій промисловості автори рекомендують їх використовувати для виявлення

зон ризику та небезпеки на діючих шахтах; для розвідки покинутих кар'єрів; для пошуку та порятунку людей; для оцінки зони зсуву; виявлення тріщин у вибоях шахт.

Török та ін. [3] запропонували методику, яка поєднує використання даних, зібраних БПЛА, із лазерним скануванням даних, отриманих на землі, для визначення зон розломів у недоступних для людини областях кар'єру. Це дослідження доводить можливість використання БПЛА в поєднанні з контрольними польовими вимірюваннями та дистанційними вимірюваннями для моделювання зон розломів, які можуть бути основою для підрахунку геологічних запасів.

Автор [4] надав комплексний огляд поточного стану технології застосування безпілотників в гірничодобувній промисловості та запропонував до використання літаючий дрон у підземних умовах шахти.

Авторами розглянуто можливість застосування дистанційного зондування, 3D-картографії навколишнього середовища шахти, управління рухом, контролю руди, картографування розривів породи. Також вчені рекомендують використовувати БПЛА для вимірювання фрагментації породи після проведених вибухів; для визначення токсичного середовища, проведення термічного моніторингу, виявлення гарячої точки, тощо.

В роботі [5] авторами виконано аналіз функціональних можливостей БПЛА в різних сферах, зокрема й в гірничій промисловості. Розглядається можливість використання БПЛА з бездротовими сенсорними мережами для підвищення ефективності видобутку та забезпечення безпечного робочого середовища для шахтарів.

Авторами критично представлені потенційні можливості застосування БПЛА в шахтах і варіанти їх використання. В роботі також обговорюється базова архітектура бездротової мережі для шахтного високонапруженого робочого середовища. Також із врахуванням можливих сценаріїв катастроф на шахті, автори пропонують систему зв'язку для надзвичайних ситуацій на базі БПЛА.

Запропонована в роботі система спостереження на базі БПЛА допоможе шахтарям і членам рятувальних команд у різних надзвичайних ситуаціях.

F. Sheikh та інші [6] за основну мету своєї роботи ставили комплексне оцінювання застосування БПЛА в гірничій справі й на цій основі надали рекомендації щодо їхнього використання. Дослідження було проведено в шахті Soapstone.

Отримані та оброблені дані обстеження, виконаного з використанням БПЛА, автори порівнювали зі звичайними методами обстеження. Виконане дослідження дозволило довести легкість отримання даних за допомогою БПЛА на території підприємств гірничодобувної промисловості.

Автори наголошують на важливості забезпечення безпеки робітників на шахтах. Безпека може

бути забезпеченою за умови, що всі робочі зони будуть під постійним спостереженням і контролем. Це можна зробити за допомогою таких ефективних інструментів, як БПЛА.

Крім вирішення питання безпеки, автори пропонують використовувати отримані дані та зображення для розрахунку площ, аналізу запасів, оцінювання стійкості забою.

Вчені довели переваги БПЛА, показали великий комплекс робіт, які можна виконувати з їхнім застосуванням в гірничодобувній промисловості.

Alvarado M. та інші [7] проаналізували можливість застосування БПЛА на відкритих розробках, де вибухові роботи є невід'ємною частиною великомасштабного відкритого видобутку корисних копалин, які часто відбуваються в безпосередній близькості від населених пунктів і часто призводять до викидів твердих частинок і газів, потенційно небезпечних для здоров'я.

Відомі методи моніторингу якості повітря передбачають обмежену кількість фіксованих місць відбору проб для перевірки складного середовища та збору достатньої кількості даних для підтвердження ефективності моделі.

Дані польотних приладів, що передаються як телеметрія з БПЛА, забезпечують миттєві мікрометеорологічні дані високої роздільної здатності, які можуть допомогти в інтерпретації концентрацій, виявлених бортовими датчиками якості повітря. Крім того, ця інформація, включаючи місце знаходження, мікрометеорологічні дані та якість повітря, може надходити в режимі реального часу до аналітичного програмного забезпечення.

З метою доведення ефективності застосування літального апарату авторами використовувалися БПЛА з нерухомим крилом і з кількома гвинтами. Доведено, що за допомогою БПЛА можна проводити швидкі й точні вимірювання змінюючи траєкторію польоту.

Dunnington L., Nakagawa M. [8] дослідили можливість застосування БПЛА, обладнаного газовими датчиками, для фіксації викидів газу над вугільними шарами.

Автори встановили, що додатковий потік повітря від дрона перешкоджає здатності приладу відчувати газ. Тому дрон додатково оснастили мініатюрним інфрачервоним передавачем вуглекислого газу, який за потреби може реєструвати до 100% об'єму вуглекислого газу. Це забезпечує додатковий рівень безпеки.

Як бачимо проблема використання БПЛА у гірничій промисловості є актуальною, різноплановою й потребує подальших розробок вчених. Такий інтерес наукової спільноти доводить перспективність застосування БПЛА.

Розглянемо нижче найбільш перспективні моделі, які на даний час рекомендовані до застосування у гірничій промисловості.



Рис. 1 - Дрон DJI Matrice 300 RTK з підвісом Zenmuse H20T і газоаналізатором U10

Дрон має час польоту 35 хвилин, дальність передачі - 15 км, максимальна швидкість - 84 км/год. Дрон створено на базі польотної платформи Matrice 300 RTK, підвісу Zenmuse H20T та газоаналізатора U10. Час польоту – до 35 хвилин, в одному корпусі Zenmuse H20T знаходиться радіометричний тепловізор, ширококутна 12 Мп камера та 20 Мп камера із зумом.

Застосування M300 RTK або інших моделей DJI з відповідним обладнанням на борту та ПЗ для обробки дозволяє виконувати кілька досить складних, але надзвичайно важливих місій: створення карток місцевості, ортофотопланів, тривимірних мо-

делей рельєфу та об'єктів на ньому, а також виявлення різних аномалій геологічного характеру. Отримані дані будуть необхідні для створення планів польових робіт, будівництва під'їзних шляхів та інфраструктури, подальшого розвитку об'єкта.

Для проведення цілодобового моніторингу роботи об'єкта (або цілого комплексу об'єктів), роботи співробітників, а також місій щодо охорони різних об'єктів (як вдень так й в нічний період) проводять із використанням моделі DJI Phantom 4 RTK (рис.2). Для таких цілей встановлюються спеціальні камери (тепловізійні, інфрачервоні), а також при необхідності додаткові освітлювальні прилади або інше обладнання.



Рис.2- DJI Phantom 4 RTK

У гірничому видобутку безпілотні літальні апарати (БПЛА) вже сьогодні спроможні вирішувати щонайменше кілька завдань:

- картографію місцевості та 3D-моделювання навколишнього простору;
- геологорозвідка;
- контролю процесу видобутку, будівництва об'єктів;
- охорона;
- дослідження підземних шахт та їх інфраструктури;
- забезпечення безпеки видобутку та охорони праці;

- оптимізація під'їзних доріг та інфраструктури в цілому.
- моніторинг стану занедбаних шахт та прилеглих зон;
- керування хвостовими відвалами;
- моніторинг викидів газів у реальному часі.

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VETERINARY SCIENCES

EFFECTIVENESS OF DRUGS FOR NEMATODOU INVASION OF HORSES

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ЕФЕКТИВНІСТЬ ПРЕПАРАТІВ ЗА НЕМАТОДОЗНОЇ ІНВАЗІЇ КОНЕЙ

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Abstract

Our research established a significant spread of nematode infestation among the farm's horses. So, out of 19 examined heads, 15 were affected by nematodes. The extent of invasion was 78.95%. According to the morphological features of the eggs isolated from the feces of sick horses, eggs of the strongylid type, *Parascaris* and *Oxyuris* were found. Anthelmintic brovermectin-gel once, individually on the root of the tongue in a dose of 0.2 mg per 1 kg of body weight (according to DR) or 1 cm³ per 20 kg of body weight (in medicinal form) and nemasectin once, orally in a dose of 1 g per 50 kg of the animal's body weight individually on the root of the tongue on the 12th day after the use of the drugs showed 100% effectiveness against strongylides, parascarides and oxyuris.

Анотація

Нашими дослідженнями встановлено, значне розповсюдження нематодозної інвазії серед коней господарства. Так, з 19 обстежених голів нематодозами було вражено 15 голів. Екстенсивність інвазії становила 78,95 %. За морфологічними ознаками яєць виділених із фекалій хворих коней, були виявлені яйця стронгілідного типу, параскарисів та оксіурисів. Антигельмінтик бровермектин-гель одноразово, індивідуально на корінь язика у дозі 0,2 мг на 1 кг маси тіла (по ДР) або 1 см³ на 20 кг маси тіла (по лікарській формі) та немасектин одноразово, перорально у дозі 1 г на 50 кг маси тіла тварини індивідуально на корінь язика на 12 день після застосування препаратів показали 100 %-ну ефективність проти стронгілід, параскарид та оксіурисів.

Keywords: horses, strongylids, parascarids, oxyuris, eggs, extensiveness of invasion, exteneffectiveness, ineneffectiveness.

Ключові слова: коні, стронгіліди, параскариди, оксіури, яйця, екстенсивність інвазії, екстенефективність, інтенефективність.

Актуальність теми. З реформуванням агропромислового комплексу України і переходом його на ринкову економіку, галузь конярства набуває інтенсивного розвитку і популярності [1, с.9; 2, с. 56].

Висока ураженість коней гельмінтами – одна з найактуальніших проблем, що стримує розвиток галузі конярства в Україні. Гельмінтози завдають значних економічних збитків, особливо внаслідок загибелі лоша́т, а також затримки їх росту і розвитку, зниження роботоздатності і приростів. Переважно, гельмінтози у коней, мають хронічний перебіг, без виражених клінічних ознак [3, с. 89; 4, с. 40]. Тому й лікувальні та профілактичні заходи у коней не завжди проводяться [5, с. 68; 6, с. 187]. Все це сприяє поширенню інвазійних захворювань і призводить до формування та розвитку стійких во́гнищ інвазій в окремих господарствах та фермах [7, с. 198].

Дослідження науковців-паразитологів України вказують на значне поширення гельмінтозів у коней [8, с. 55; 9, с. 18; 10, с. 78; 11, с. 100; 12, с. 29]. Основний метод боротьби із цими хворобами – використання антигельмінтних препаратів. У ветеринарній паразитології був розроблений цілий арсенал досить ефективних хімічних препаратів для боротьби з кишковими нематодозами (бензimidазоли, піримідини, тетрамізоли, антибіотики аверсектинового ряду тощо). Були розроблені різні схеми застосування цих препаратів для свійських тварин. Сучасний фармацевтичний ринок антигельмінтних препаратів досить різноманітний [13, с. 270]. У той же час вибрати найбільш ефективні препарати складно. Оскільки, відомо, що тривале їх застосування призводить до появи лікоопірності у гельмінтів і, як наслідок, – зниження ефективності [14, с. 55; 15, с. 15]. Окрім того, відсутні препарати, що успішно діють проти інцистованих в стінці кишечника паразитичних личинок нематод. Відсутність ефективних шляхів профілактики інвазій спричиняє розвиток хронічних ензоотій стронгілідозів.

Необхідно також зазначити, що сучасні стратегії антигельмінтного лікування тварин спрямовані на знищення паразитичних стадій нематод в організмі хазяїна. При цьому популяція вільноживучих личинок на пасовищах залишається поза дією програм боротьби з паразитами. З літературних джерел відомо, що приблизно 95 % популяції гельмінтів знаходиться на пасовищі у вигляді личинкових стадій і лише біля 5 % популяції паразитує в організмі тварини-хазяїна. В даний час у ветеринарній паразитології виникла гостра необхідність створення нових програм для контролю нематодозів з урахуванням недоліків попередніх стратегій контролю, тривалості й ефективності їхньої дії. На думку ряду авторів [16, с. 62; 17, с. 18] таким ефективним методом може стати програма інтегрованого контролю паразитарних хвороб тварин.

Мета роботи – встановити поширення змішаної нематодозної інвазії серед коней в умовах навчально-виробничого центру (НВЦ) Білоцерківського національного аграрного університету (БНАУ) та показати ефективність двох вітчизняних антигельмінтиків у формі пасти та гелю за даною інвазією.

Матеріали та методи. Робота виконана з жовтня по листопад місяці 2023 року на базі науково-виробничого центру та наукової лабораторії кафедри паразитології та фармакології Білоцерківського національного аграрного університету.

З метою виявлення яєць нематодозів шлунково-кишкового тракту в ранковий час від кожного коня індивідуально відбирали фекалії і досліджували з використанням лічильної камери для овоскопічних досліджень [18, с. 4]. Для цього із загальної змішаної копропроби відбирали 1 г фекалій, поміщали у мірний стаканчик на 30 мл. Сюди вносили незначну кількість (до 5 мл) флотацийного розчину (насиченого розчину гранульованої аміачної селітри з щільністю 1,3). Фекалії ретельно розмішували у розчині, яким доводили об'єм зависі до 30

мл. Останню просіджували у інший стаканчик через металево ситечко, а після ретельного розмішування, за допомогою піпетки через виріз основи камери вносили в одну із комірок, яка вважалась заповненою, коли завись повністю витисне повітря з під верхньої пластини приладу. Мікроскопію проводили через 2 хвилини після заповнення комірки. Цей час необхідний для флоатації яєць, після закінчення якої вони розміщуються на поверхні фекальної зависі, тобто в одній площині з сіткою камери. В полі зору мікроскопа (при малому збільшені) знаходили сітку камери, вона служила орієнтиром для підрахунку яєць гельмінтів, що знаходились в комірці. Далі заповнювали другу комірку приладу зависсю з іншої проби фекалій. Після підрахунку яєць гельмінтів у кожній із комірок камери, їх кількість множили на 10 (коефіцієнт, отриманий математичним шляхом: виходячи з того, що флоатаційну суміш із наважкою досліджуваних фекалій доводили до об'єму 30 мл, а об'єм комірки лічильної камери 3 мл) і отримували число, яке свідчить про кількість яєць в 1 г фекалій досліджуваної тварини.

З метою вивчення гельмінтологічної ситуації в господарстві щодо оксіурозу було проведено копрологічне дослідження на наявність яєць гельмінтів. З цією метою проводили дослідження зскребоків з періанальних складок, оскільки самки оксіур відкладають яйця навколо ануса тварин. З цією метою маленькою пластиковою паличкою з ватним тампоном, змоченим у 50 %-му розчині гліцерину робили зскрібок із періанальних складок, внутрішньої сторони кореня хвоста та ділянки промежини, який переносили на предметне скельце в 2–3 краплі гліцерину, накривали покривним скельцем і досліджували під мікроскопом на наявність яєць оксіур

Основним критерієм зараженості були екстенсивність та інтенсивність інвазії (EI, %; та П, кількість яєць у 1 г фекалій, ЯГФ). Визначення видової належності яєць гельмінтів проводили за атласом диференційної діагностики В.Ф. Галата та ін. [19, с. 110].

Експериментальна частина роботи проводилась з урахуванням „Загальних етичних принципів експериментів на тваринах”, схвалених на Національному конгресі з біоетики (Київ, 2001) [20, с. 144] із дотриманням міжнародних вимог Європейської конвенції „Про захист хребетних тварин, що використовуються для дослідних та інших наукових цілей” (Страсбург, 1986) [21, с. 51].

Для дегельмінтизації коней ми використали бровермектин-гель ТОВ «Бровафарма» та немасектин корпорації „Укрзооветпромстач”. Дослід по вивченню антигельмінтної ефективності обробки коней бровермектин гелем та немасектином ми провели на конях віком від 6 місяців до 15 років спонтанно інвазованих змішаною нематодозною інвазією. З цією метою відібрали для дослідів 15 коней, спонтанно інвазованих змішаною нематодозною інвазією (стронгіліди, параскариди) і сформували 3 групи тварин (по 5 голів) на основі дотримання принципу аналогів і розділили на дві піддослідні і одну контрольну групи. В період проведення дослідів (який тривав 15 днів) піддослідні і контрольні групи тварини знаходились в однакових умовах годівлі та утримання.

Тваринам першої піддослідної групи ми застосовували бровермектин-гель (рис. 1), одноразово, індивідуально на корінь язика в дозі 0,2 мг на 1 кг маси тіла (по ДР) або 1 см³ на



Рис. 1. Зовнішній вигляд упаковки бровермектин гель

20 кг маси тіла (по лікарській формі). Бровермектин-гель який представляє собою гель білого кольору, напівпрозорий, однорідної консистенції. 1 мл препарату містить 4 мг івермектину. Івермектин – суміш двох напівсинтетичних похідних авермектинів, які належать до макроциклічних лактонів. Стимулює виділення нейромедіатора гальмування гамма-аміномасляної кислоти (ГАМК), блокує пе-

редачу нервових імпульсів через інтернейрони вентрального нервового стовбура нематод і нервово-м'язові з'єднання членистоногих, спричинюючи параліч і загибель паразитів.

Тваринам другої піддослідної групи ми застосовували немасектин (рис. 2) одноразово, перорально у дозі 1 г на 50 кг маси тіла тварини індивідуально на корінь язика.



Рис. 2. Зовнішній вигляд упаковки немасектин (паста для коней)

Немасектин (паста для коней) – протипаразитарний препарат проти широкого спектру. Діюча речовина препарату, аверсектин С, який впливає на величину потоку іонів хлору через мембрани нервових і м'язових клітин паразита. Основною ціллю є глютамат-чутливі хлорні канали, а також рецептори гама-аміномасляної кислоти. Зміна потоку іонів хлору порушує проведення нервових імпульсів, що приводить до паралічу і загибелі паразита. Препарат в організмі паразита посилює утворення нейромедіатора гама-аміномасляної кислоти

(ГАМК), яка зв'язується зі спеціальними рецепторами нервових закінчень, блокуючи нервові імпульси, що викликає параліч і загибель паразита.

Результати дослідження. У результаті гельмінтоовоскопічних досліджень встановлено значне розповсюдження нематодозів шлунково-кишкового каналу у господарстві. Так, з 19 обстежених голів коней нематодозами було вражено 15 голів. Екстенсивність інвазії становила 78,95 %, а тварин вільних від нематодозів було 4 голови, що становило 21,05 % (табл. 1).

Таблиця 1

Зараженість коней нематодозами травного каналу

Вікові групи коней	Всього досліджено тварин, гол.	Всього тварин вільних від гельмінтів, гол.	Всього уражено тварин гельмінтами, гол.	у тому числі		
				стронгілідами	параскаридами	оксіурами
Лошата до 1 року	1	–	1	–	1	–
Лошаки від 1 до 2 років	2	–	2	1	2	–
Коні від 2 до 5 років	5	1	4	4	2	1
Коні від 5 до 10 років	5	2	3	3	1	1
Коні старше 10 років	6	1	5	4	–	2
Всього досліджено голів	19	4	15	12	6	4
Екстенсивність інвазії, %	–	21,05	78,95	80,00	40,00	26,67

За морфологічними ознаками яєць виділених із фекалій хворих коней, були виявлені яйця стронгілідного типу, параскарисів та оксіурисів. Таким чином, у коней нами було встановлено паразитування нематод, які відносяться до трьох підрядів, а саме: *Strongylata*, *Ascaridata* та *Oxyurata*.

Нами зареєстровано, що найчастіше (80,00 %) у коней господарства реєстрували збудників стронгілідозів травного каналу (табл. 1) (рис. 3), дещо меншою мірою – збудника параскарозу (40,00 %) (рис. 4) і найменшою – оксіурою (26,67 %).

Результати гельмінтоовоскопічних досліджень коней до дегельмінтизації наведені у таблиці 2. Як

видно з даної таблиці, всі коні, як дослідних так і контрольної груп були уражені на 83,33 % яйцями стронгілід, а інтенсивність інвазії коливалась від 119,4 до 131,0 екземплярів яєць у 1 грамі фекалій. Ураженість коней параскаридами становила 33,33 %, а інтенсивність інвазії коливалась від 51,0 до 58,0 екз яєць. Зараженість коней оксіурами складала 16,67 %, а інтенсивність інвазії від 9,0 до 14 екз яєць у однієї краплини.

На 12-й день, після останньої дачі антигельмінтиків ми знову відібрали проби фекалій. Результати гельмінтоовоскопічних досліджень коней після дегельмінтизації наведені у таблиці 3.

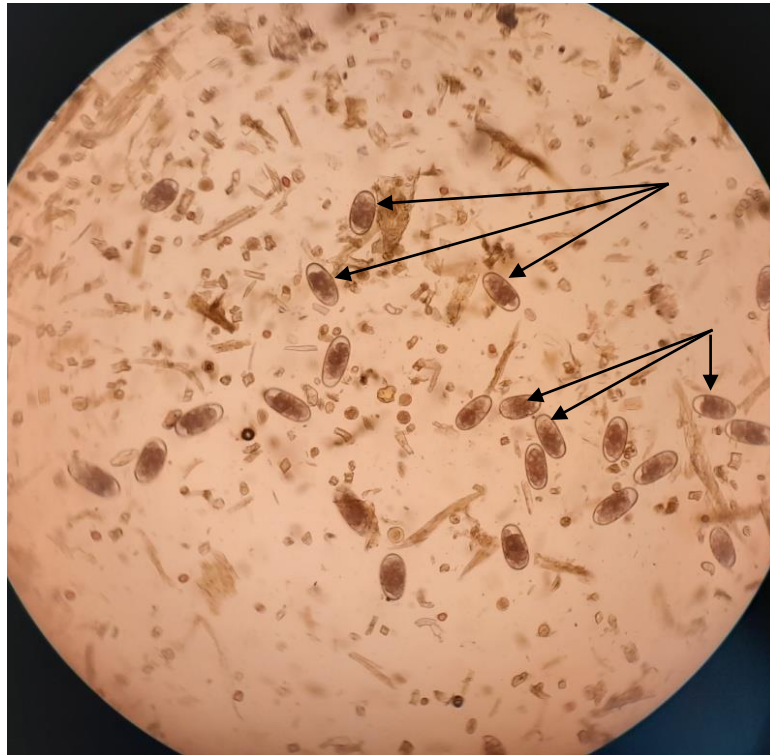


Рис. 3. Зовнішній вигляд яєць родини Strongylidae



Рис. 4. Зовнішній вигляд яєць *Parascaris equorum*

З даної таблиці видно, що антигельмінтик бровермектин-гель одноразово, індивідуально на корінь язика у дозі 0,2 мг на 1 кг маси тіла (по ДР) або 1 см³ на 20 кг маси тіла (по лікарській формі) та немасектин одноразово, перорально у дозі 1 г на 50 кг маси тіла тварини індивідуально на корінь язика показали 100 %-ну ефективність проти стронгілід, параскарид та оксіурисів.

Таблиця 2

Рівень зараження коней нематодозами до дегельмінтизації

Групи тварин	Всього тварин у групі, гол.	Ураженість тварин								
		стронгілідами			параскаридами			оксіурисами		
		уражено, гол.	Е.І., %	І.І., екз.	уражено, гол.	Е.І., %	І.І., екз.	уражено, гол.	Е.І., %	І.І., екз.
Дослідна 1	6	5	83,33	125,6	2	33,33	54,5	1	16,67	11,0
Дослідна 2	6	5	83,33	131,0	2	33,33	51,0	1	16,67	14,0
Контрольна	6	5	83,33	119,4	2	33,33	58,0	1	16,67	9,0

Таблиця 3

Рівень зараження коней нематодозами після дегельмінтизації

Групи тварин	Всього тварин у групі, гол.	Ураженість тварин								
		стронгілідами			параскаридами			оксіурисами		
		уражено, гол.	Е.Е., %	І.Е., %	уражено, гол.	Е.Е., %	І.Е., %	уражено, гол.	Е.Е., %	І.Е., %
Дослідна 1	6	0	100	100	0	100	100	0	100	100
Дослідна 2	6	0	100	100	0	100	100	0	100	100
Контрольна	6	0	100	100	0	100	100	0	100	100

Таким чином можна зробити висновки:

1. НВЦ БНАУ являється неблагополучним щодо змішаної нематодозної інвазії коней. Ураженість коней стронгілідами склала 80,00 %, параскаридами 40,00 % та оксіурисами було уражено 26,67 %.

2. Антигельмінтики бровермектин-гель у дозі 0,2 мг на 1 кг маси тіла (по ДР) або 1 см³ на 20 кг маси тіла (по лікарській формі) одноразово, індивідуально на корінь язика та немасектин одноразово, перорально у дозі 1 г на 50 кг маси тіла тварини індивідуально на корінь язика являються високоефективними препаратами при змішаній нематодозній інвазії (ЕЕ та ІЕ = 100 %).

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