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STUDY OF HEPATOPROTECTIVE ACTIVITY OF GRAPE SEED POLYPHENOL EXTRACTS IN A MODEL OF ACUTE PARACETAMOL-INDUCED HEPATITIS

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ABSTRACT

Aim

Drug-induced liver injury is a significant problem, so the aim of our research was to study the hepatoprotective properties of polyphenolic extracts from "Rkatsiteli" and "Caberne" grape seeds in a model of acute medical liver injury caused by the administration of paracetamol. Acute drug-induced hepatitis was simulated using one of the most popular antipyretic analgesics, paracetamol, known to be hepatotoxic. Experiments were performed on 24 nonlinear mature male white rats weighing 200-240 g. The experimental animals were orally administered paracetamol at a dose of 1250 mg/kg once a day for a 24-hour period. The experimental animals were divided into five groups: the intact control group; the control pathology group; animals in the third group, in which against the background of paracetamol liver damage the reference preparation Silibor was administered at a dose of 25 mg/kg; animals in the fourth and fifth experimental groups, in which against the background of paracetamol hepatitis were administered polyphenolic extracts from "Rkatsiteli" and "Caberne" grape seeds at a dose of 0.5 ml/kg. The administration of paracetamol in toxic doses resulted in severe damage to the hepatic parenchyma, which was accompanied by the formation of necrotic cells in the central and middle sections of the hepatic lobes. Increase of ALT activity in serum of experimental animals by 2.1 times indicated the development of a pronounced cytolytic syndrome. Administration of polyphenolic extracts from "Caberne" and "Rkatsiteli" grape seeds to the tested animals was accompanied by normalization of the indices characterizing the state of LPO/AOS. Thus, the content of TBA-AP in liver tissue of the experimental animals decreased by 35.7% and 31.2%, respectively, and the level of reduced glutathione normalized similarly, increasing by 59.9% and 52.3%. Although the increase of catalase activity in serum of animals in the control pathology group was not statistically significant, it was statistically lower in animals treated with the studied polyphenol complexes from grape seeds than in untreated animals, which was not observed when using the comparison drug. Consequently, the obtained experimental data indicate that polyphenolic extracts from "Caberne" and "Rkatsiteli" grapes seeds show high therapeutic efficacy in conditions of acute toxic liver injury by paracetamol, have a distinct effect on peroxidation syndrome development, normalizing LPO/AOS balance, syndrome and significantly improving the functional state of the liver.

Introduction

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Redox reactions are involved in numerous physiological and pathological processes; moreover, cellular homeostasis depends on the interaction between oxidants and the defense system, which includes reductants and antioxidant enzymes. The prevalence of free radicals, such as reactive oxygen species and reactive nitrogen species, at a desirable level can contribute to cell growth and differentiation. However, the overproduction of free radicals is destructive, resulting in oxidative stress and contributing to various diseases, such as cardiovascular diseases, cancer, diabetes, obesity, neurodegenerative disorders, and liver diseases.

In many cases, toxic liver damage develops as a complication of drug therapy. A significant number of medications exhibit hepatotoxic effects. These include NSAIDs (Indomethacin, Paracetamol), oral antidiabetic drugs (similar Sulfonylurea, Biguanides), antituberculotic drugs (Isoniazid), antibiotics (Tetracyclines, Macrolides - Erythromycin, Oleandomycin, Rifampicin), diuretics (Furosemide), indirect-duty anticoagulants (Phenylin), Phenothiazine neuroleptics. Paracetamol is widely used in practical medicine and is an effective and relatively safe antipyretic and analgesic agent, but its prolonged use can be accompanied by toxic liver damage. This led to the relevance of investigating the therapeutic effect of polyphenolic extracts of grape seed in comparison with a hepatoprotective drug called Silibor on the model of hepatitis caused by paracetamol.

Paracetamol is an effective analgesic/antipyretic drug when used at therapeutic doses. However, the overdose of paracetamol can cause severe liver injury and liver necrosis. The mechanism of paracetamol-induced liver injury is still not completely understood. Reactive metabolite formation, depletion of glutathione and alkylation of proteins are the triggers of inhibition of mitochondrial respiration, adenosine triphosphate depletion and mitochondrial oxidant stress leading to hepatocellular necrosis. Role of oxidative stress in paracetamol-induced liver injury: The importance of oxidative stress in paracetamol hepatotoxicity is controversial. Paracetamol-induced liver injury cause the formation of reactive oxygen species. The potent sources of reactive oxygen are mitochondria, neutrophils. Kupffer cells and the enzyme xatnine oxidase. Free radicals lead to lipid peroxidation, enzymatic inactivation, and protein oxidation. Role of mitochondria in paracetamol-induced oxidative stress: The production of mitochondrial reactive oxygen species is increased, and the glutathione content is decreased in paracetamol overdose. Oxidative stress in mitochondria leads to mitochondrial dysfunction with adenosine triphosphate depletion, increase mitochondrial permeability transition, deoxyribonucleic acid fragmentation which contribute to the development of hepatocellular necrosis in the liver after paracetamol overdose. Role of kupffer cells in paracetamol-induced liver injury: Paracetamol activates Kupffer cells, which then release numerous cytokines and signalling molecules, including nitric oxide and superoxide. Kupffer cells are important in peroxynitrite formation. On the other hand, the activated Kupffer cells release anti-inflammatory cytokines. Role of neutrophils in paracetamol-induced liver injury: Paracetamol-induced liver injury leads to the accumulation of neutrophils, which release lysosomal enzymes and generate superoxide anion radicals through the enzyme nicotinamide adenine dinucleotide phosphate oxidase. Hydrogen peroxide, which is influenced by the neutrophil-derived enzyme myeloperoxidase, generates hypochlorus acid as a potent oxidant. Role of peroxynitrite in paracetamol-induced oxidative stress: Superoxide can react with nitric oxide to form peroxynitrite, as a potent oxidant. Nitrotyrosine is formed by the reaction of tyrosine with peroxynitrite in paracetamol hepatotoxicity.

Aim

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Drug-induced liver injury is a significant problem, so the aim of our research was to study the hepatoprotective properties of polyphenolic extracts from "Rkatsiteli" and "Caberne" grape seeds in a model of acute medical liver injury caused by the administration of paracetamol.

Materials and methods

Acute drug-induced hepatitis was simulated using one of the most popular antipyretic analgesics, paracetamol, known to be hepatotoxic. Experiments were performed on 24 nonlinear mature male white rats weighing 200-240 g. The experimental animals were orally administered paracetamol at a dose of 1250 mg/kg once a day for a 24-hour period. The experimental animals were divided into five groups: the intact control group; the control pathology group; animals in the third group, in which against the background of paracetamol liver damage the reference preparation Silibor was administered at a dose of 25 mg/kg; animals in the fourth and fifth experimental groups, in which against the background of paracetamol hepatitis were administered polyphenolic extracts from "Rkatsiteli" and "Caberne" grape seeds at a dose of 0.5 ml/kg. Extracts studied were administered intragastrical one hour after administration of the toxic agent. The comparison drug Silibor was administered according to the same scheme: the first two days in parallel with paracetamol, and then one more day. On the third day, the animals were removed from the experiment by decapitation. In liver tissue, the content of TBA-active products (TBA-AP), reduced glutathione (RG) and catalase activity were determined, and the activity of alanine transaminase (ALT), γ-glutamyl transpeptidase (GGTP), alkaline phosphatase (ALP), total protein (TP) and urea were determined in the serum of the test animals.

Results and discussion

The results of the experiment on hepatoprotective effect of polyphenolic extracts from grape plant under conditions of acute paracetamol hepatitis, given in Table 1, showed that administration of paracetamol in toxic doses led to a marked increase in intensity of lipid peroxidation processes. Intensity of lipid peroxidation was manifested by the increase of the amount of TBA-AP in the liver tissue of the control group by 36.0% and the reduced level of renewed glutathione by 35.9%. At the same time, the increase in catalase activity was not statistically significant and showed little trend.

The administration of paracetamol in toxic doses resulted in severe damage to the hepatic parenchyma, which was accompanied by the formation of necrotic cells in the central and middle sections of the hepatic lobes. Increase of ALT activity in serum of experimental animals by 2.1 times indicated the development of a pronounced cytolytic syndrome.

Table 1. Study of the hepatoprotective effect of polyphenolic extracts from grape seeds in a paracetamol-induced hepatitis model (n=6).

Indicator/ Group	Intact control	Control pathology	Caberne, 0.5ml/kg	Rkatsiteli, 0.5ml/kg	Silibor, 25 мг/кг
In the liver tissue					
TBA-AP, μmol/g	63.03±4.80	85.74±4.41*	55.13±6.28**	58.97±5.13**	69.23±4.71**
RG, r.u.	44.85±4.38	28.73±2.63*	45.95±3.71**	43.76±1.73**	40.48±2.19**
Catalase, mkat/l	2.64±0.19	3.18±0.19	2.42±0.18**	2.45±0.26**	2.50±0.26

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In the serum					
ALT, μmol/h•l	0.76±0.07	1.58±0.07*	1.17±0.10*/**	1.15±0.10*/**	0.99±0.05*/**
GGTP, μmol/h•l	3.09±0.21	6.55±0.75*	4.67±0.25*/**	4.71±0.31*/**	3.74±0.28**
ALP, mkat/l	3.25±0.24	4.63±0.32*	3.74±0.15**	3.78±0.26	3.53±0.27**
TP, g/l	59.20±1.91	53.60±1.57*	60.00±1.58**	59.40±2.11**	60.80±1.88**
Urea, mol/l	7.36±0.50	6.20±0.39	7.08±0.38	6.94±0.61	7.80±0.64

Notes:
* – differences that are statistically reliable on intact control, p>0.05;
**– differences that are statistically reliable on control pathology, p>0.05;
n – number of animals in the group.

Functional abnormalities developing against the background of paracetamol damage to the liver are obviously a consequence of metabolic changes and necrotic changes that occurred in the hepatic parenchyma. Signs of cholestatic syndrome development were observed, which was manifested by significant increase of ALP and GGTP activity in serum of animals of control pathology group.

There was also disruption of biosynthetic processes, in particular protein biosynthesis in hepatocytes, as evidenced by a significant decrease in serum protein levels. At the same time there were no significant violations of detoxification (ammonia-depleting) function of the liver (the level of urea in blood serum did not change statistically), which allows to estimate the severity of hepatocellular syndrome as moderate. The severity of the pathological changes was significantly reduced by the application of grape polyphenolic extracts and the Silibor comparison. Administration of polyphenolic extracts from "Caberne" and "Rkatsiteli" grape seeds to the tested animals was accompanied by normalization of the indices characterizing the state of LPO/AOS. Thus, the content of TBA-AP in liver tissue of the experimental animals decreased by 35.7% and 31.2%, respectively, and the level of reduced glutathione normalized similarly, increasing by 59.9% and 52.3%. Although the increase of catalase activity in serum of animals in the control pathology group was not statistically significant, it was statistically lower in animals treated with the studied polyphenol complexes from grape seeds than in untreated animals, which was not observed when using the comparison drug. Although the overall effect of the comparison drug on LPO processes and the state of the antioxidant system was less pronounced, Silibor also led to normalization of the oxidative balance. The level of TBA-AP decreased by 19.3% and the content of reduced glutathione increased by 40.1% with the use of Silibor. Although the application of the studied agents resulted in normalization of the LPO/AOS indices, the signs of cytolytic syndrome persisted. Administration of polyphenol extracts from "Caberne" and "Rkatsiteli" grape seeds to experimental animals led to a decrease in ALT activity in blood serum by 25.9% and 27.2% respectively, but enzyme activity remained elevated compared with intact control. Silibor exhibited a slightly more pronounced anticytolytic effect, reducing ALT activity by 37.3%, but also did not lead to its complete normalization. A significant improvement in the functional state of the liver was observed during treatment with Silibor and polyphenol complexes from grape seeds, which proved to be a normalization of protein synthesis function and restoration of serum proteins. At the same time, a significant decrease in GGTP activity was observed. When polyphenolic extracts from grape seeds "Caberne" and "Rkatsiteli" were applied, GGTP activity decreased by 28.7% and 28.1%, respectively. When polyphenolic extract from grape seeds "Caberne" was administered, ALP activity was completely normalized, and in animals treated with polyphenolic extract from grape seeds "Rkatsiteli", it did not differ from the parameters of animals

of intact control and control pathology groups. The changes revealed suggest a reduction in the severity of the cholestatic syndrome when using the studied polyphenolic extracts from grape seeds. At the same time, administration of Silibor resulted in complete normalization of ALP and GGTP activity, indicating the superiority of the comparison drug in its effect on the development of cholestasis syndrome.

Conclusions

Consequently, the obtained experimental data indicate that polyphenolic extracts from "Caberne" and "Rkatsiteli" grapes seeds show high therapeutic efficacy in conditions of acute toxic liver injury by paracetamol, have a distinct effect on peroxidation syndrome development, normalizing LPO/AOS balance, syndrome and significantly improving the functional state of the liver. It is also established that the reference preparation Silibor shows in conditions of acute paracetamol hepatitis somewhat more distinct influence, in comparison with the investigated polyphenol complexes from grape seeds, on development of cytolytic and cholestatic syndrome.

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THE KEY ASPECTS OF MANIFESTATION OF THE ISSUES OUTCOMES OF DRUG ADDICTION AND PHARMACOTHERAPY REPLACEMENT VIEWPOINTS FEATURES, PROGNOSIS, ACHIEVEMENTS, PREDICTIONS AND CHALLENGES IN MODERN MEDICINE AND HEALTH

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ABSTRACT

Aim of the research was to study and analyze the issues outcomes of drug addiction and pharmacotherapy replacement viewpoints features, prognosis, achievements, predictions and challenges in modern medicine and health. Treatment with effective therapeutic drugs of mania, schizophrenia, depression, bipolar disorder, generalized anxiety disorder, panic disorder, obsessive compulsive disorder, Alzheimer's disease, etc., during the second half of the 20th century (third period), has drawn attention to population heterogeneity in the diagnostic categories of schizophrenia and depression. Future of psychopharmacology, the breakthrough of genetics and molecular biology in psychopharmacology has contributed enormously to understanding the osteopathological basis of mental illness and has helped to identify several new targets for drug development. Nevertheless, it has been disappointing that despite this progress, the successful introduction of new drugs into clinical practice remains very modest. Neurobiological aspects of opioid addiction regular use of opioids causes neuroadaptive reactions in various brain neurons involved in motivation, memory, behavior control and disinhibition processes. Over the past decade, knowledge about the neurobiological aspects of drug addiction has grown significantly. Certain brain structures are known to play an important role in regulating pleasure-related behaviors. Neuronal pathways leading to and from these areas form the so-called "Circles of feedback". They are located in the mesocorticolimbic dopamine systems that originate in the ventral tegmental areas and project to the Nucleus Accumbens, the amygdala, and the prefrontal cortex. The different opioid receptors emerged, and further pharmacological studies identified three classes of opioid receptors, namely the mu, delta, and kappa receptors. Opioid receptors belong to the G protein-coupled receptors, and each receptor class includes several subtypes.

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Opioid effects of analgesia, euphoria and sedation are predominantly mediated by mu receptors. Opioids indirectly induce dopamine release by reducing gamma-aminoerbic acid (GAM) inhibition via mu receptors in the ventral tegmental area. They also directly induce dopamine release by interacting with opioid receptors in the nucleus accumbens. The effects of chronic opioid exposure on human opioid receptors are not well understood. Tolerance develops through multiple mechanisms, including acute desensitization of the opioid receptor (which develops within minutes of opioid use and resolves within hours of use) and long-term opioid receptor desensitization (which persists for several days after opioid agonist withdrawal). Changes are also observed in the number of opioid receptors - in particular, there is a compensatory up-regulation of cyclic adenosine monophosphate (cAMP).When an opioid is withdrawn, the cAMP cascade is hyperactivated, leading to a “noradrenergic storm” that manifests clinically as a state of opioid withdrawal and thus creates a motivation to resume taking the drug. Long-term changes in neuronal circuitry similar to those seen in learning and memory are observed with regular opioid use. This effect leads to a high risk of relapse to opioid use, even after a long-term abstinence state. The main drugs used to treat opiate addiction in adolescents are similar to those used in adults, mainly methadone and buprenorphine. Both drugs can be used to support abstinence lasting several weeks or months. They can also be used for long-term stabilization and for maintenance and inspection times. The conditions for dose induction and titration can be at home or in a day clinic. This depends on the age of the child/teen, the severity of the addiction and other factors such as the impact of mental health issues, other medications used, and family/social support. All these drugs must be administered under supervision. As with adults, thorough assessment of addiction by competent groups, including toxicologists, is required. Attention should be paid to the initial tolerance, as it is not always so pronounced in young people. Dose induction and titration are like adults, but care should be taken to start with the daily loading dose and initial escalation, usually beginning with a lower dose (eg, less than 30 mg methadone per day or less), taking into account the age and physique of the child/adolescent, but also knowledge of signs of tolerance and intoxication or continued drug withdrawal. Caution is advised, but introducing too little methadone too slowly can also lead to further illicit heroin use, for example with additional risks. These problems can be solved by providing the young person with very thorough information, with the guarantee of frequent examinations in order to adjust the treatment if necessary. For people addicted to prescription opioids such as tramadol or over-the-counter opioids, there is little evidence to guide drug selection. Clinical practice includes the use of buprenorphine replacement therapy or the use of the originally prescribed drug at reduced doses. Clinical consensus suggests that stabilization with a long-acting replacement drug such as buprenorphine may be more beneficial, when appropriate, to allow time to assess all other needs, fully involve the young person and their family, and develop and implement a plan of care. However, this can be addressed on a case-by-case basis by monitoring stabilization (avoiding ups and kickbacks). The length of the stabilization phase and duration of detoxification depend on clinical risk, severity of addiction, use/dependence on other drugs or alcohol, social functioning, mental health issues, marital status, and criminal behavior.

Keywords: Aspects, drug, addiction, pharmacotherapy, replacement, achievements, challenges, modern, medicine, health.

Introduction

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Clinical guidelines address psychosocial and pharmacological approaches, as well as the social context in which people cope with their problems and receive help in treatment and recovery. Pharmacological approaches remain extremely important and have clearly proven effective and efficient for those who have problems with the use of heroin or other opiates. However, this approach is of limited use in treating people with problems associated with the use of other types of drugs. It is also important that many of those who come into contact with care services seek ways to cope with their mental health problems and the effects of past trauma, as well as provide support to find decent work, stable housing, as well as family and other social support. There have been positive developments in increasing the availability of community-based psychosocial interventions, as well as peer support and mutual assistance for people in treatment for drug addiction. However, there are also areas with obvious shortcomings, including the lack of effective support for social inclusion, including employment and housing, which remain under-provided for this group. Significant progress has been made, including on some associated health complications, such as significant improvement in the treatment of chronic hepatitis C infection. We are honored to provide updated guidance on these new treatments, and it is our shared responsibility to do so to ensure new treatments that are used to achieve health benefits. The systems and services to meet these needs can vary widely. Previous versions of the manual were written when the system was largely split between prescribing secondary health care and providing advice and support to the voluntary sector. Today the situation is quite different, as the number of specialized health workers has been drastically reduced and large independent or third sector organizations are the main providers of health care under various cooperation arrangements. Regardless of the composition of the launch and implementation, the principles underlying the clinical guidelines remain fundamental and must be carefully considered to ensure better coverage, better quality and adequate monitoring of the benefits of various treatment-based therapies, as the evidence is that they should be put into service. in order to meet the clinical needs of the population with health problems. Despite advances in reducing the number of young people currently developing heroin addiction, the morbidity, mortality and long-term needs of a cohort of elderly patients with long-term heroin addiction problems mean that treatment is becoming increasingly complex. and coordination between services is essential. This includes greater integration into general, physical and mental health care. Furthermore, a large number of new psychoactive substances with little-known long-term effects pose new challenges for doctors [1-3].

A good therapeutic alliance is essential to any therapeutic intervention, whether medical or psychosocial. As stronger supportive relationships are formed, service users are more likely to complete treatment, actively investigate problems, experience less stress and feel more comfortable, abstain from alcohol and drugs during treatment, and have better outcomes with long-term drug use. Key competencies of clinicians or practitioners in building the therapeutic alliance that underpins the effective delivery of any psychosocial intervention include: the ability to appropriately involve the patient with a satisfactory level of kindness and attention; the ability to inspire trust and to do so. namely, adopting a personal style that matches the patient's style; the ability to adjust the type and intensity of intervention to the patient's abilities; the ability to understand and work with the patient's emotional context, including the patient's motivation. Studies of general attitudes or beliefs among therapists show that more flexible orientations and the ability to use different approaches lead to better outcomes. The most effective way for

services to ensure such a positive therapeutic relationship is established is through regular clinical monitoring by appropriately qualified professionals [4-6].

Anxiety frequently coexists with depression and adding benzodiazepines to antidepressant treatment is common practice to treat people with major depression. However, more evidence is needed to determine whether this combined treatment is more effective and not any more harmful than antidepressants alone. It has been suggested that benzodiazepines may lose their efficacy with long-term administration and their chronic use carries risks of dependence [7-9].

The modern world suffers from the “epidemic of mental illness”. Since the 1950s the field of pharmacotherapy has developed rapidly and, indeed, is also developing with our knowledge of mental illnesses and their causes. To better understand the drugs of today and tomorrow, it will be necessary to explore its history, its technological evolution, its categories and its statistics on the subject [10-12].

The history of drug therapy for mental illness can be divided into three periods. The introduction of morphine, potassium bromide, chloral hydrate, hyoscine, paraldehyde, etc., during the second half of the 19th century (early period), led to the replacement of coercion physically by pharmacological means under behavioral control [13-14].

The introduction of nicotinic acid, penicillin, thiamine, etc., during the first half of the 20th century (second period), led to significant changes in the diagnostic distribution of psychiatric patients; psychoses due to cerebral pellagra, and dementia due to syphilitic general paralysis have practically disappeared from psychiatric hospitals, and the prevalence of dysmnesia has markedly decreased [15-17].

Insomnia is the subjective state of unsatisfactory sleep (eg, sleep initiation, sleep maintenance, early awakening, impaired daytime functioning). Insomnia disorder impairs quality of life and is associated with an increased risk of physical and mental health problems, including anxiety, depression, drug and alcohol abuse, and more medical attention frequent. sleeping pills (eg, benzodiazepines and Z-drugs) are allowed to improve sleep, but can lead to tolerance and dependence, although many people continue on long-term treatment. The use of antidepressants for insomnia is widespread, but none are licensed to treat insomnia, and the evidence for their effectiveness is unclear. This use of unlicensed drugs may be driven by concerns about the prolonged use of sleeping pills and the limited availability of psychological therapies [18-20].

Antidepressants had a positive effect on some significant outcomes associated with depression and alcohol use, but not on other significant outcomes. Moreover, most of these positive effects ceased to be significant when studies with a high risk of bias were excluded. The results were limited by a large number of studies showing a high or unclear risk of bias and a small number of studies comparing one antidepressant to another or antidepressants to other drugs. In people with concomitant depression and alcohol dependence, the risk of side effects appears to be minimal, especially for new classes of antidepressants (such as selective serotonin reuptake inhibitors). According to these findings, in people with both depression and alcohol dependence, antidepressants may be useful for treating depression, alcohol dependence, or both, although the clinical relevance may be modest [21-23].

Aim of the research was to study and analyze the key issues of manifestation of the issues outcomes of drug addiction and pharmacotherapy replacement viewpoints features, prognosis, achievements, predictions and challenges in modern medicine and health.

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Methodology

The main question of this article was to research and analyses the key issues of manifestation of the issues outcomes of drug addiction and pharmacotherapy replacement viewpoints features, prognosis, achievements, predictions and challenges in modern medicine and health. We have searched and analyzed Pub Med, Web of Sciences, Clinical key, Tomson Routers and Google Scholar mostly, using search terms bases, including the words to research and analyses specificities of invocation, outlook and character of the clinical pharmacists globally. In addition to the desired subject understanding. Then, each article was discussed and an abstract of the total information gathered during the process was provided, aiming at easy understanding of the public. To establish these outcomes, over two hundred articles were investigated. We brought together all published data to comprehensively examine the effects in a systematic review, to define the roll out of the study of the key issues of manifestation of the issues outcomes of drug addiction and pharmacotherapy replacement viewpoints features, prognosis, achievements, predictions and challenges in modern medicine and health.

Result and Discussion

Alcohol dependence is a serious public health problem characterized by relapsing, medical and psychosocial complications. Co-occurrence of major depression in people undergoing treatment for alcohol dependence is common and a risk factor for morbidity and mortality that negatively impacts treatment outcomes.

Combination therapy with antidepressants and benzodiazepines more effective than antidepressant monotherapy in reducing depression severity, response to depression, and early depression remission. However, these effects did not persist in the acute or long-term phase. Combination therapy resulted in fewer dropouts from the study due to side effects than antidepressants alone, but combination therapy was associated with a higher proportion of participants reporting at least one adverse effect. Moderate-quality evidence on the benefits of adding benzodiazepines to early-stage antidepressants should be reasonably weighed against the potential risks and other alternative treatment strategies considered when antidepressant monotherapy may be considered inadequate [24-27].

Alcohol and other drugs have long been used recreational purposes. The so-called illegal drugs are substances whose non-medical use is prohibited by international control systems. Illicit drugs include, but are not limited to, opioids such as heroin, morphine, opium and other pharmaceutical opioids cannabis, amphetamines, and cocaine. Addiction to illicit and prescription drugs can develop in people who take them regularly over a long period of time and is characterized by loss of control over and overuse and increased awareness of use substances in human life [28-30].

The importance of preventing and treating drug use problems in the elderly is becoming increasingly important as the German population grows and ages. Two separates but sometimes overlapping groups of older people with problem drug use have been described and may be useful in clinical practice to meet a range of needs. Older adults with a long history of substance use that continues into adulthood, including long-term users of heroin, crack, tobacco or alcohol, may be called “early adopters” to distinguish them from the sometimes quite diverse group of older adults. "Late adherents". Early users may already have experienced significant drug or alcohol-related complications that may affect their life expectancy and need for treatment (eg, need for treatment for hepatitis C). Many older drug users, especially heroin drug users, may have a long history, including negative experiences with services such as day care, the criminal justice system,

and health care, that have shaken their faith in the services as a result of stressful life events or lifestyle changes. that typically occur later in life (for example, the latter group tends to be a larger but less visible population of drug addicts' older people) who typically use prescription or over-the-counter medications (such as benzodiazepines and opioid pain relievers) or consume problematic amounts of alcohol. users undergoing treatment for physical or mental health problems, with suspicions or attitudes of simply having a self-inflicted disorder, attitudes that may conflict with expectations or affect the confidence of older dependents. Even within specialist drug treatment services, some drug users may receive suboptimal care or be excluded from services for inconclusive reasons, due to changes in professional approach over time, or simply due to changes in medical staff. Tobacco and alcohol use is more harmful at the population level in the older age group, and these issues need to be addressed in those undergoing treatment for other addictions. Currently, there are an increasing number of users of addiction treatment services who continue to receive opioid substitution therapy aged 50 and over. Nearly half of people who seek addiction treatment services for opiate-related problems are now 40 years of age or older. The number of people seeking treatment in this age group has increased in recent years, although the total number of people seeking treatment has declined significantly. This reflects a declining trend in the incidence of heroin addiction, along with an aging cohort of lifelong addicts. In recent years, there has also been an increase in the number of people over the age of 40 seeking treatment for alcohol dependence. The median age of drug-related deaths (primarily opioid-related) has also increased over the past decade. Continued injection drug use remains a key factor in overdose mortality [31-36].

Prescriptions for people over 65 often include multiple drugs with high potential for interactions and side effects. People over 65 are particularly vulnerable to the effects of drugs and alcohol due to the reduced body fat-to-water ratio, decreased ability to metabolize drugs, potential for comorbidities, and likelihood of increased drug interactions. Comorbidity may be a key factor, as age increases risk of chronic pain, insomnia, grief, loneliness, and mood disorders. In addition, memory disorders, immobility, urinary incontinence, sensory disturbances and iatrogenic problems can develop. These physiological and medical changes mean that older people, particularly those over the age of 65, may be at greater risk of consuming even small amounts of alcohol, drugs or other substances. Falls in particular can have serious consequences in adulthood. When prescribing psychiatric drugs for this age group, the general recommendation is to "start slowly and gradually". First. A family doctor can be made aware of a substance use disorder in an older person by contacting a suspected substance use disorder, writing prescriptions for certain medications, or contacting an affected family member. Older people may experience the same or better results than younger people when beginning addiction treatment. It is important that they have access to effective health services where they are cared for with dignity and compassion.

The main drugs used to treat opiate addiction in adolescents are similar to those used in adults, mainly methadone and buprenorphine. Both drugs can be used to support abstinence lasting several weeks or months. They can also be used for long-term stabilization and for maintenance and inspection times. The conditions for dose induction and titration can be at home or in a day clinic. This depends on the age of the child/teen, the severity of the addiction and other factors such as the impact of mental health issues, other medications used, and family/social support. All of these drugs must be administered under supervision. As with adults, thorough assessment of addiction by competent groups, including toxicologists, is required. Attention should be paid to the initial tolerance, as it is not always so pronounced in young people. Dose induction and

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titration are similar to adults, but care should be taken to start with the daily loading dose and initial escalation, usually beginning with a lower dose (eg, less than 30 mg methadone per day or less), taking into account the age and physique of the child/adolescent, but also knowledge of signs of tolerance and intoxication or continued drug withdrawal. Caution is advised, but introducing too little methadone too slowly can also lead to further illicit heroin use, for example with additional risks. These problems can be solved by providing the young person with very thorough information, with the guarantee of frequent examinations in order to adjust the treatment if necessary. For people addicted to prescription opioids such as tramadol or over-the-counter opioids, there is little evidence to guide drug selection. Clinical practice includes the use of buprenorphine replacement therapy or the use of the originally prescribed drug at reduced doses. Clinical consensus suggests that stabilization with a long-acting replacement drug such as buprenorphine may be more beneficial, when appropriate, to allow time to assess all other needs, fully involve the young person and their family, and develop and implement a plan of care. However, this can be addressed on a case-by-case basis by monitoring stabilization (avoiding ups and kickbacks). The length of the stabilization phase and duration of detoxification depend on clinical risk, severity of addiction, use/dependence on other drugs or alcohol, social functioning, mental health issues, marital status, and criminal behavior.

`Treatment with effective therapeutic drugs of mania, schizophrenia, depression, bipolar disorder, generalized anxiety disorder, panic disorder, obsessive compulsive disorder, Alzheimer's disease, etc., during the second half of the 20th century (third period), has drawn attention to population heterogeneity in the diagnostic categories of schizophrenia and depression.

Children and adolescents identified as suicidal were often excluded from studies, so we cannot be sure about the effects of these drugs on these people. If an antidepressant is being considered for an individual, this should be done in consultation with the child/adolescent and their family/career, and it remains critical to ensure that treatment effect and suicidal outcomes (combination of suicidal thoughts and suicidal attempts) are carefully monitored.). in patients treated with new generation antidepressants, given the evidence that some of these drugs may be associated with a higher likelihood of these events. Consideration of psychotherapy, especially cognitive behavioral therapy, according to guidelines remains important.

The introduction of the first series of psychotropic drugs and the Spectro photo fluorimeter in the 1950s sparked the development of neuropsychopharmacology. The introduction of genetic technology for the separation of receptor subtypes in the 1980s paved the way for the "tailoring" of psychotropic drugs at the dawn of the 21st century to receptor affinities. There are known general groups of drugs for mental illness:

Antidepressants are drugs commonly used to treat depression. Antidepressants are also used for other health problems, such as anxiety, pain, and insomnia. Although antidepressants are not specifically approved by the FDA to treat ADHD, antidepressants are sometimes used to treat ADHD in adults.

Medicines for anxiety, anxiety medications help reduce symptoms of anxiety, such as panic attacks, or extreme fear and worry. The most common anti-anxiety medications are called benzodiazepines. Benzodiazepines can treat generalized anxiety disorder. In the case of panic disorder or social phobia (social anxiety disorder), benzodiazepines are generally second-line treatments, behind SSRIs or other antidepressants. Antidepressants had a positive effect on some significant outcomes associated with depression and alcohol use, but not on other significant outcomes. Moreover, most of these positive effects ceased to be significant when studies with a

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high risk of bias were excluded. The results were limited by a large number of studies showing a high or unclear risk of bias and a small number of studies comparing one antidepressant to another or antidepressants to other drugs. In people with concomitant depression and alcohol dependence, the risk of side effects appears to be minimal, especially for new classes of antidepressants (such as selective serotonin reuptake inhibitors). According to these findings, in people with both depression and alcohol dependence, antidepressants may be useful for treating depression, alcohol dependence, or both, although the clinical relevance may be modest.

Ethical principles in accordance with the right to self-determination and the attainment of the highest possible standard of health as defined in Article of the International Covenant on Economic, Social and Cultural Rights, a person should have the right to freely choose whether or not to participate in treatment. WHO's Mental Health, Human Rights and Law Resource Book states that for consent to be valid, it must meet the following criteria: The person/patient giving consent must be competent to do so; Competence is assumed unless otherwise stated; Consent must be obtained independently, without threats or undue pressure; It is necessary to provide information accordingly and adequately. We must provide information about the purpose, method, expected duration and expected benefits of the proposed treatment; About the possible pain and discomfort and the risk of the proposed treatment, as well as the side effects. This information should be discussed with the patient; According to good clinical practice, if possible, the patient should be offered a choice of alternative treatment methods, especially less invasive ones; Information should be provided in a language that is understandable to the patient; The patient must have the right to refuse treatment or stop treatment; Consequences of refusing treatment should be explained to the patient, which may include discharge from the hospital; Consent must be documented in the patient's medical records; The right to consent to treatment implies that there is also the right to refuse treatment. If we believe that the patient has the capacity to give consent, we must respect his decision even if he does not give consent.

Stimulants: as the name suggests, stimulants increase alertness, attention, and energy, as well as blood pressure, heart rate, and respiration. Stimulant medications are often prescribed to treat children, adolescents, or adults diagnosed with ADHD.

Antipsychotic drugs are primarily used to manage psychosis. The word psychosis is used to describe conditions that affect the mind, where there has been some loss of contact with reality. It can be a symptom of a physical condition like drug addiction or a mental disorder like schizophrenia, bipolar disorder, or very severe depression (also called “psychotic depression”).

Mood stabilizers are used primarily to treat bipolar disorder, mood swings associated with other mental disorders, and in some cases to increase the effect of other medicines used to treat depression. Lithium, which is an effective mood stabilizer, is approved for the treatment of mania and the maintenance treatment of bipolar disorder. A few cohort studies describe the anti-suicide benefits of lithium for individuals on long-term maintenance.

Modern Psycho Pharmacology-Drugs are an important part of modern therapy, often accompanied by consultations and conversations with the specialist. Science has proven that environment (stress, lifestyle, trauma) is not a single factor in mental health issues.

Genetic mental illnesses can be invisible and therefore difficult to find. For example, chromosome disorders, (XXX in women, delayed intelligence development and XXY in men, severe aggression).

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The recent introduction of CRISPR-Cas-based techniques now facilitates gene editing, which could enable genome editing at multiple sites, not only in model animals, but also in other species, including humans.

In the early 2000s, the human genome was sequenced, bringing new expectations of deciphering the genetic basis of mental illness. Psychiatry was again revolutionized by the development of high-throughput genotyping platforms allowing genetic association studies and the identification of genetic risk factors for psychiatric disorders. Psychiatric genetics and genome-wide association studies could help identify new drug targets and possibly new drug therapies for brain disorders.

The development of epigenetics represents a third important breakthrough. For decades, the "nature vs. nurture" debate has played an important role in the behavioral sciences, particularly in the field of psychiatry and psychopharmacology. If on the one hand preclinical and clinical research has shown that the presence of specific genetic traits contributes to the development of affective disorders and psychiatric disorders. On the other hand, it was also clear that the process of disease development was influenced by a number of other elements generically defined as "environmental factors". These factors include stress, lifestyle, education, individual experiences, and many others. With the development of epigenetics, the "nature vs nurture" dichotomy is dissipating. It is now clear that the environment can influence the expression of genetic traits and that the genome and epigenome interact with each other to form endophenotypes. Despite genetic vulnerability, the environment influences the propensity to develop a disease. On the other hand, genetically non-vulnerable subjects, if they are exposed to particularly harmful environments or to certain individual experiences, can develop psychiatric pathologies.

Optogenetics and chemo genetics are two other recent innovations. Future of psychopharmacology, the breakthrough of genetics and molecular biology in psychopharmacology has contributed enormously to understanding the osteopathological basis of mental illness and has helped to identify several new targets for drug development. Nevertheless, it has been disappointing that despite this progress, the successful introduction of new drugs into clinical practice remains very modest.

Major pharmaceutical companies are currently withdrawing from research and drug discovery programs in psychiatry, and in the past 10 years, very few new products have been brought to market. Most currently available treatments remain or are derived from these agents introduced by chance discoveries in the mid-1950s, the magic years of psychopharmacology. While very few innovative biological mechanisms identified over the past 30 years have been successfully targeted with new drugs. The reasons for this lack of success are manifold. For one thing, CNS drug development is inherently complicated, and compared to treating other diseases, success rates remain low. Moreover, in the case of neuropsychiatric drugs, the strict requirements imposed by regulatory bodies discourage the pharmaceutical industries. Paradoxically, a third reason that hampers drug development in neuropsychiatry is the appeal that molecular biology and genetics had for basic scientists. This change of interest has attracted researchers to these new disciplines which drain human and financial resources from classical neuropsychopharmacology.

Gender difference in psychopharmacology is another aspect that needs attention. FDA published its Guideline for the Study and Evaluation of Gender Differences in the Clinical Evaluation of Drugs. Since the publication of this document, the inclusion of female subjects in clinical trials has gradually increased. Nevertheless, preclinical research is still based on animal models originally developed with males. Traditionally, males are preferred over females to avoid potential confounding factors related, for example, to hormonal fluctuations associated with the

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estrous cycle. The perception is that these fluctuations can influence behavior, decrease consistency of results, and enhance variability in response to drugs. It is short-sighted to ignore women who make up more than half of the world's population, who use these drugs at a higher rate, and who show differences from men in etiopathology and prevalence. For example, it is well known that mental illnesses, such as depression, anxiety, eating disorders and post-traumatic stress disorder, are more common in women, while alcohol abuse and antisocial personalities are predominant in males.

Genetic and molecular biology techniques have gradually replaced classical pharmacological approaches to probe the validity of biological targets or test new osteopathological mechanisms. There is general optimism that the introduction of these new approaches will help advance our knowledge of psychiatry and develop more effective long-term treatments. In the short term, the reduced interest in using pharmacological tools to study biomedical questions reduces the cross-fertilization between basic science and applied research in the pharmaceutical industry.

Major depression is often treated with a combination of antidepressants with benzodiazepines. Benzodiazepines are a family of anxiolytic and hypnotic drugs. This review asked whether combination treatment with antidepressants and benzodiazepines, compared with treatment with antidepressants alone, affects depressive symptoms, the rate of recovery, and the acceptability of these treatments, based on the number of people who prematurely discontinue participation in the study (called the dropout rate), in adults with major depression. The combination of antidepressants and benzodiazepines was more effective than antidepressant monotherapy in relieving depression and symptoms early in treatment (one to four weeks), but there was no evidence of a difference later in treatment. There was no evidence of a difference in acceptability (based on dropout) between combination treatment and antidepressants alone. The rate of treatment discontinuation due to unintended and unwanted effects (side effects) was lower for antidepressants plus benzodiazepines compared with antidepressants alone, although at least one side effect was more frequently reported in those treated with a combination of antidepressants and benzodiazepines.

Steps should be taken to involve the basic sciences and the pharmaceutical industry in a joint effort to increase the chances of successful development of new drugs. Developing a clear and well-structured translational approach for drug development is a major challenge in CNS drug development. From a preclinical perspective, it is essential to develop better animal models to mimic the complex traits typical of psychiatric conditions. At the clinical level, when possible, it is important to deconstruct psychiatric categories into identifiable endophenotypes and to group patients into populations that are as homogeneous as possible. In addition, it is important to have biomarkers or surrogate markers that can be determined in laboratory animals and in humans. Finally, pharmacological manipulations should be used in conjunction with molecular and genetic approaches.

Addiction is well known to be associated with it high level of physical and mental disorders. Most chronic chemical dependencies on drug addiction are also associated with it very high mortality rates, estimated to be several times those of the non-clinical population. Since addictive substances are known to disrupt cell growth and cell division, it can be assumed that they particularly affect dividing cells such as stem cell pools and progenitor cells. They are also known either individually or in combination to potentiate apoptosis, i.e., contributes to this effect. The medicine of aging in recent times has become an independent scientific discipline. Cellular the aging hypothesis suggests that the aging phenotype. The organism is associated with cellular

correlates of age associated changes including cell loss, reduced cell velocity. Renewal and more aging, negligible functional and non-replicating cells in tissues. So, when the anti-growth effects of drug addiction can reasonably occur throughout the body. Expect signs of accelerated aging to be evident. One would expect such a putative progeroid effect to occur are subject to increased morbidity and mortality rates clinically observed almost identically in drug addicts as is the case in the geriatric population. In this connection various changes, consideration of all clinical aspect's expression of this general toxicology hypothesis of opioids.

Various complications of heroin intoxication have been described in the literature, including pulmonary edema, shock, myocardial injury, acute renal failure, rhabdomyolysis, and leukoencephalopathy. To date, not a single case of heroin intoxication with damage and dysfunction of six organs has been registered. There are several hypotheses regarding the pathogenesis of complications of heroin intoxication, including the primary toxic role of heroin, hypoxia, ischemia-reperfusion injury, anaphylactic reactions, and the toxic role of impurities. However, recent investigators have not found sufficient evidence to support the hypotheses of anaphylactic reactions and the toxic role of contaminants.

The injection of opiates, particularly heroin and subutex (buprenorphine), poses a particular problem. It has been established that the main route of transmission of infection among registered HIV-infected persons is through injection drug use. Although HIV prevalence among IDUs (injecting drug users) is only 1-3%, the large number of IDUs and the high prevalence of hepatitis C in this population pose a high risk of high spread of HIV. HIV in Georgia. Since late 2005, the GFATM (Global Fund to Fight HIV/AIDS, Tuberculosis and Malaria) has been supporting methadone substitution therapy programs in Georgia. Three programs are currently underway. Studies conducted by the Institute for the Study of Addictions to monitor the effectiveness of pilot programs have shown a significant improvement in the psychophysical state of patients with a very high level of rehabilitation and decriminalization and a significant reduction in problems related to Drugs. risky behavior. The results show that methadone substitution treatment programs in Georgia are highly effective as an important tool for both opioid dependence treatment and harm reduction. To have a greater impact on public health, further expansion of substitution therapy programs is needed.

Recently, opioid δ-receptor agonists have been proposed as interesting targets for the development of new antidepressants. Several studies have shown that single treatment with δ-opioid receptor agonists has antidepressant effects in the forced swim test, which is one of the most popular animal models for antidepressant screening. In addition, sub chronic treatment with δ-opioid receptor agonists has been shown to completely attenuate the hyperemotional responses found in olfactory bulbectomy rats. This animal model exhibits hyperemotional behavior that may mimic the anxiety, aggression, and irritability seen in depressed patients, suggesting that δ-opioid receptor agonists may be effective in treating these symptoms in depression. On the other hand, the prototype opioid δ receptor agonists cause convulsive effects that limit their therapeutic potential and clinical development. In this review, we present current knowledge of the antidepressant-like effects of δ-opioid receptor agonists, including some recently developed non-convulsant drugs.

The biological effects of endogenous opioid peptides are mediated through three classes of naloxone-sensitive opioid receptors: mu (μ), kappa (κ), and delta (δ). Several lines of evidence suggest a role for opioid receptor systems in depression, including early studies examining the potential of antidepressant therapy with endogenous opioid peptides in humans. For example, it

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has been shown that serum levels of β-endorphin (an endogenous opioid peptide that binds to μ and δ opioid receptors) are significantly increased in depressed patients after treatment with antidepressants. Elevated plasma levels of β-endorphin in patients following electroconvulsive shock (ECS) treatment for depression have also been reported, suggesting that endogenous μ- and/or δ-opioid receptors were at least partially involved in the mechanisms of the antidepressant action of electroconvulsive shock (ECS). In fact, β-endorphin has been reported to rapidly exert antidepressant effects in depressed patients. Clinical trials have also demonstrated the efficacy of the μ-opioid receptor agonists oxycodone, oxymorphone and buprenorphine in patients with refractory major depression. In contrast, the nonselective opioid receptor antagonist naltrexone was shown to cause psychiatric depression in self-reported volunteers in an open-label, placebo-controlled study. Taken together, these data suggest that endogenous opioid systems play an important role in the pathogenesis of depression.

There is growing concern about illicit drug use and its complications. Health risks in many countries. The non-medical use of various classes of prescription drugs (opioid analgesics, benzodiazepines, anxiolytics, and sedative-hypnotics) should be considered because of serious health risks. The increase in non-medical use of legal and illegal drugs has led to increased medical needs, poisoning and deaths. The use of prescription opioids along with illicit drugs and alcohol, as seen in the polydrug model, has contributed to deaths in many countries. The administration of illegal drugs and unsterile crushed tablets introduces many pathogens and other harmful substances into the body. In addition, many impurities and impurities drugs are injected into the blood on the street. In addition to the risk of overdose, toxicity and death, illicit drug users have a high incidence of acute and chronic illness and organ failure. There are many classes of drugs used around the world, but their use varies in extent, patterns and trends across countries and societies. Each class of drugs, their impurities and impurities have their own side effects in the body.

Impaired lung function due to COVID-19 can also put people with opioid use disorder, methamphetamine, and other stimulant use disorders at risk. Chronic respiratory disease increases the risk of fatal overdose in opioid users therapeutic. In addition, the slowing of breathing due to opioids causes hypoxemia, which can lead to cardiac, pulmonary, and brain complications and, in severe cases, overdose and death. Methamphetamine is a highly toxic drug that causes lung damage, pulmonary hypertension and cardiomyopathy, and its use has increased dramatically. Physicians should be alert to the possibility of an increased risk of side effects from COVID-19 in methamphetamine users.

People with opioid use disorder may have difficulty getting medication or receiving services through needle exchange programs. Social distancing will make opioid overdoses more likely when there are no bystanders giving naloxone to reverse them, and therefore more likely to be fatal. Physicians in the emergency department with increased workloads are less likely to initiate buprenorphine treatment for patients with opioid use disorder, which is an important part of opioid crisis relief. In response to these concerns, the substance abuse and mental health administration has recommended that opioid treatment programs should be more flexible in dispensing drugs into homes during the pandemic and the drug enforcement administration has issued guidelines to facilitate prescribing.

Opioid use disorder is a chronic brain disorder that occurs due to the effects of long-term opioid use on brain structure and function. These brain changes and the resulting addiction can be treated with life-saving drugs, but these drugs are out of reach for most people who need them.

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Methadone, buprenorphine, and long-acting naltrexone are safe and highly effective drugs already approved in many countries to treat opioid use disorder. By alleviating withdrawal symptoms, reducing opioid cravings, or reducing future responses to drug use, these drugs reduce the likelihood that people with opioid use disorder will relapse into drug use and risk a fatal overdose. These drugs also help people regain their ability to function, improve their quality of life, and reintegrate into their families and communities. These drugs save lives, but most people with opioid use disorder in the United States go untreated.

As with any other condition, people with opioid use disorder should not be denied medication without proper medical justification. To refuse them for ideological or other unproven reasons is to deny people the medical care they need. However, some drug treatment facilities that prohibit drugs are still supported by funding streams linked to the criminal justice system or housing authorities, creating strong incentives to refer patients to non-drug treatments.

As the number of people with opioid use disorder increases, the need for treatment far exceeds current capacities. Many systemic barriers prevent people from accessing these drugs. For example, when facilities offering opioid use disorder treatments are segregated from the rest of healthcare, the associated regulatory and legal requirements can create significant barriers to accessing opioid use disorder drugs. The current opioid use disorder delivery system is fragmented and unfair, requiring coordinated action to overcome the inertia that has escalated the crisis to this point. Containing the epidemic requires a practical strategy across all sectors – healthcare, criminal justice, patients and families and beyond – because no one sector can solve the crisis alone. Making access to medicines much wider and more equitable is the first priority for making significant progress in saving the lives of people with opioid use disorder.

Addiction is a chronic illness associated with the compulsive or uncontrolled use of one or more substances despite adverse consequences. As with other chronic diseases, a combination of genetic, environmental, and social factors determines a person's susceptibility to addiction and ease of recovery from it. These factors determine a person's propensity to use and continue using drugs, as well as a person's susceptibility to certain types of neurobiological changes in the brain that characterize addiction progression. Based on decades of research, the scientific community has rallied around the brain disease addiction model. In people with opioid use disorder and other substance use disorders, long-term and repeated drug use has long-lasting effects on brain structure and function over time. Prescription and illicit opioids have powerful and lasting effects on the brain's opioid system; repeated use can deregulate the system and lead to tolerance, physical dependence and dependency. The data shows that these brain changes can be effectively treated with drugs that help people avoid drug use, significantly reducing the risk of overdose and death. By relieving opioid cravings and withdrawal symptoms, medications may also offer ways to address the behavioral and social components of addiction that are critical to both the development of the disorder and its treatment.

This scientific understanding of opioid use disorder is at odds with the prevailing public perception of the disorder, which is shaped by misconceptions about addiction as a mere moral failure. This widespread belief has been spread through generations by socially stigmatizing people who use drugs; This misplaced stigma has extended to medications used to treat opioid use disorder as well. In fact, people with Opioid use disorder have a chronic condition that, like many others, requires long-term care beyond occasional emergencies.

Opioid use disorder is caused by changes in brain circuits that can be treated with medication to restore healthy brain function, resulting in improved addictive behaviors. The drugs currently

approved by the FDA for the treatment of opioid use disorder are evidence-based, safe, and highly effective. The Opioid use disorder medications aim first to control withdrawal symptoms and then to control or eliminate the patient's compulsive opioid use, most commonly with methadone or buprenorphine agonists. Large systematic reviews and randomized controlled trials show that patients with Opioid use disorder who receive these drugs are less likely to die from overdose or other causes related to their addiction. Patients taking medication have longer treatment durations, better long-term treatment outcomes, and better social functioning; they are also less likely to inject drugs or transmit infectious diseases. For patients who have been in opioid withdrawal long enough, extended-release naltrexone can be used for maintenance therapy. The available evidence clearly supports drug use and the need to improve drug access to reduce or eliminate compulsive opioid use, reduce the risk of premature death, and improve the quality of life for people with opioid use disorder and their families.

Methadone, buprenorphine, and long-acting naltrexone act on mu-opioid receptors of the opioid system. Because each drug has a different mechanism of action, the most appropriate drug and dosage will vary from patient to patient and may vary in the same patient over the course of treatment. Existing drugs are very effective, but not perfect; For example, data gaps remain on how to select the most effective drug for a given patient and how to maintain treatment, which is a major challenge. Because Opioid use disorder has complex behavioral and social causes and consequences, it remains to be seen which behavioral interventions are most appropriate to restore patients to full functioning. So, while urgent action is needed to improve access to existing medicines, innovation must not stagnate. Research should remain focused on developing new and better drugs to treat Opioid use disorder, identifying the most effective behavioral therapies for maximum results, and improving the most appropriate protocols for their effective use.

Methadone (methadone hydrochloride) is a long-acting, potent synthetic opioid agonist. Its main target is mu opioid receptors. In people who have not taken opioids, methadone has qualitatively the same effects as morphine and other opioids; However, in opioid-dependent patients, the right dose of methadone prevents the development of both withdrawal and withdrawal symptoms, leaving patients feeling "normal".

Methadone has a high (85%) bioavailability (that is, the amount of therapeutically active drug that reaches the systemic circulation and acts after oral administration). The maximum concentration in the blood is reached 2-4 hours after taking the dose. Methadone is distributed in tissues and 60-90% binds to proteins of methadone. It is demethylated by liver cytochrome P450 3A4 and 2D6 (CYP2D6) enzymes to its main metabolite - 2-ethylidine-1.5-dimethyl-3.3-diphenylpyrrolidine. This inactive metabolite is excreted in feces and urine along with unchanged methadone. Simultaneous use of other drugs acting on these enzymes may cause clinically significant interactions.

Methadone dose should be adjusted accordingly. During methadone replacement therapy, a decrease in its serum concentration has been described, indicating the development of tolerance, liver due to auto-induction of microsomal enzymes.

Usually, patients tolerate methadone well, but in some cases, the following side effects may be noted: asthenia, edema, constipation, sweating, dry mouth, sleep disturbances, decreased libido, weight gain, etc. Especially noteworthy is the increase in the QT interval on the electrocardiogram and, accordingly, the increase in the risk of arrhythmias when receiving high doses of methadone, which is why regular monitoring of the patient's condition is desirable. The risk of overdose is high when methadone is administered to an opioid-intolerant person, so care must be taken in

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diagnosis, patient assessment, and initial dosing to avoid overdose and respiratory depression. Since methadone is mainly metabolized in the liver, it should be administered with caution to patients with severe liver dysfunction. In particular, drugs that are metabolized by the cytochrome P450 enzyme system should be avoided while receiving methadone, since potentiation of toxic effects may occur.

Implementation of opioid substitution treatment with methadone indications for methadone-supported substitution therapy, methadone is the most commonly used substitution drug in the world today, although the medical use of buprenorphine and buprenorphine and naloxone is becoming increasingly widespread. Although other drugs are used for supportive replacement therapy today, the effectiveness of these two substances - methadone and buprenorphine - has been sufficiently evaluated. Due to the high effectiveness of substitution therapy supported by these drugs, in 2005 the World Health Organization included methadone and buprenorphine in the main list of drugs recommended for countries. Methadone-supported substitution treatment is indicated for all opioid-dependent patients who are able to give informed consent and for whom there are no specific contraindications. Given that treatment is long and there is a potential risk of toxicity in the first two weeks, a high-confidence diagnosis should be made before starting replacement therapy with opioid agonists. Staff should also be careful when refusing a patient opioid agonist replacement therapy, as such patients have a poor clinical outcome if left untreated.

Diagnosing opioid dependence and assessing the patient opioid dependence is primarily diagnosed based on the history provided by the patient. Sometimes the patient may be motivated to exaggerate or understate his drug use; Therefore, it is usually necessary to corroborate the patient's history with the results of a physical examination and diagnostic tests. Sometimes the anamnesis collected from relatives helps us to make the correct diagnosis. In order to successfully conduct the evaluation process, it is necessary to establish a relationship between the patient and the medical staff focused on the free exchange of information. In the beginning, the patient may only be trusted to provide the information needed to begin the treatment process. However, once trust is established between patient and staff, more information can be shared. This will allow the medical staff to better tailor the treatment to the individual patient. The patient's physical, psychological, and social needs are an important part of the assessment. The assessment should also include factors that may influence drug use. These include past treatment experiences, living conditions, legal issues, professional situation, and social and cultural factors. The clinician should collect a substance use history to assess the following: Which psychoactive substances have been used in the past and which are currently used; The type of use of each substance, including information on amount and frequency of use • level of neuroadaptation to each substance; Drug-related health and social problems; Outcome of previous treatment and other interventions; Whether the patient meets criteria for abuse or dependence. How the patient views his drug use; Factors that contributed and currently contribute to the patient's use of psychoactive substances. Short-term, medium-term and long-term goals set by the patient; What brought the patient to the treatment facility this time. Clinicians must distinguish between drug dependence and drug use without dependence, as the correct selection of treatment strategies depends on the diagnosis.

An adverse drug reaction is defined as an obviously harmful or unpleasant reaction resulting from a drug-related intervention that predicts risk for future use and requires discontinuation of a specific treatment, change in dosing regimen, or product discontinuation. Currently, such reactions are reported using WHO adverse reaction terminology, which will eventually become

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part of the International Classification of Diseases. Adverse drug reactions are classified into six types (with mnemonics): dose-related, dose-related, and transient (chronic), transient (delayed), discontinuation (withdrawal), and ineffective therapy (failure). Illness, test results, and how they are retrieved can help establish a causal relationship with a suspected adverse drug reaction. Treatment includes stopping the drug when possible and specifically treating its effects. Any suspected adverse drug reaction should be reported.

In this regard, a different treatment approach has been developed- the so-called agonist maintenance therapy, or substitution therapy, which implies application of substitute narcotic substances for a relatively long period of time. It is recommended that such therapy be combined with psychosocial support activities. Today, agonist maintenance therapy is regarded by international experts as the most effective means to treat opioid-dependent persons, to ensure their decriminalization, social integration, as well as to reduce harmful effects associate with the use of 'street drugs'.

The substitution therapy is nowadays widely applied across the globe. The expansion of these programs was triggered by HIV/AIDS epidemic, as the aforesaid treatment is basically the only means to prevent the spread of HIV/AIDS and Hepatitis C among injection drug users. Buprenorphine and methadone hydrochloride, or a buprenorphine/naloxone combination, are mostly applied in the agonist maintenance therapy nowadays because of their specific therapeutic properties.

Methadone is a long-acting (lasting 24-36 hours per dose) synthetic narcotic substance. It is an opioid agonist, which implies that it has the same effect as morphine or similar narcotic substances. If applied in doses relevant to the maintenance therapy, it considerably reduces the need for drug without producing narcotic effect (so-called 'high') and eliminates withdrawal symptoms. Patient who undergoes methadone therapy under medical supervision usually feel themselves well, they are adequate and able-bodied. Such treatment allows an opioid-dependent person to improve his/her physical and mental health, to give up on criminal life, to learn and work effectively, to become a full-fledged member of his family or community. The agonist maintenance program helps some patients to completely give up drugs, including substitutes, and start a drug-free life.

Methadone hydrochloride syrup, oral solution or tablets are applied in the maintenance therapy. It is recommended that they should be taken in a specialized institution or unit, under direct supervision of healthcare personnel, in order to maximally prevent outflow of methadone from a medical institution to the 'black' market. To avoid use of illegal drugs (so-called 'street drugs') the patients are regularly subjected to urine chemical and toxicological testing for detection of narcotic / psychotropic substances. In case of patient's failure to comply with the appropriate treatment regime, including use of drugs not prescribed by a doctor, he/she may be required to quit the program.

In case the drugs are taken without a doctor's relevant prescription, the involvement in agonist maintenance therapy program in no way exempts a patient from legal liability.

Agonist maintenance therapy for opioid dependence has been recommended by the World Health Organization (WHO). This very organization has put methadone hydrochloride on the List of Essential Medicines.

Opioid substitution therapy (OST) is the most effective treatment for opioid dependence. Opioid substitution therapy programs are an effective way to significantly reduce illicit opioid drug use, HIV-related risk behaviors, overdose deaths, criminal activity, and financial and other stress

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experienced by drug users and their families. In addition, OT programs attract injecting drug users who would otherwise never come into contact with treatment facilities. Act as a gateway to access health care, HIV testing, antiretroviral therapy, tuberculosis, hepatitis C and other treatment services. These four programs are supported by the World Health Organization, the Joint United Nations Program on HIV/AIDS and the United Nations Office on Drugs and Crime. Methadone and buprenorphine are on the World Health Organization's list of essential medicines.

Regular use of opioids causes neuroadaptive reactions in various neurons of the brain, which are involved in the processes of motivation, memory, behavior control and disinhibition. Over the past decade, knowledge about the neurobiological aspects of drug addiction has grown significantly. Certain brain structures are known to play an important role in regulating pleasure-related behaviors. Neuronal pathways leading to and from these areas form the so-called "Circles of feedback". They are located in the mesocorticolimbic dopamine systems that originate in the ventral tegmental areas and project to the Nucleus Accumbens, the amygdala, and the prefrontal cortex.

The signs of opioid intoxication are mainly as follows: Euphoric mood, analgesia, constriction of the pupils, drooping of the eyelids, itching, sedation, somnolence, decrease in blood pressure, slowing of the pulse, decrease in the frequency of breathing, characteristic speech disorder, etc. The condition of opioid withdrawal is a combination of symptoms of different types and severity, marked by complete or complete withdrawal of the psychoactive substance. The onset and duration of withdrawal symptoms is limited to a certain time and depends on the psychoactive substance and its dose, which was taken before stopping or reducing the opioid drug.

The goal of the program is to reduce the harm associated with drug use and Treatment of patients suffering from drug addiction. The program services include: Inpatient detoxification and primary rehabilitation; Implementation of replacement therapy and provision of replacement pharmaceutical product delivery (transportation, escort) and providing psycho-social rehabilitation in Tbilisi and regions, including provision of short-term and long-term detoxification with a substitute pharmaceutical product in penitentiary institutions.

The goals and objectives of substitution therapy are: Improvement of the somatic and mental condition of persons suffering from opioids addiction, social adaptation, reintegration into society; Prevention of the spread of HIV-infection/AIDS, hepatitis and other blood-borne diseases; Achieving a state of remission in patients through replacement treatment and medical-social rehabilitation; Cessation/reduction of injecting drug use by opioid-addicted persons, Cessation/reduction of illegal drug/psychoactive substance use and improvement of their psychosomatic condition; Reducing the risk of public danger for persons involved in the substitution treatment program.

Today, evidence-based medicine offers the following main methods for treating opioid addiction; Opioid withdrawal; Opioid withdrawal with subsequent antagonist supportive therapy; Opioid supportive replacement therapy (agonist supportive therapy); In addition to the above, there are other methods of treatment, but today their effectiveness is not sufficiently evaluated or is considered less effective.

Substitution treatment of opioid addiction: Opioid substitution treatment is the treatment of an opioid-dependent person with a substitution drug to which the patient; Cross-dependence and cross-tolerance have been established. Agonist replacement therapy usually involves an opioid agonist (eg methadone) or taking a partial agonist (eg buprenorphine) every day. The stable level

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of opioid effect obtained is perceived by the addicted user as not intoxication or withdrawal, but as a "normal" state.

Types of opioid replacement therapy: Short-term detoxification with a replacement drug – treatment with decreasing doses of a replacement drug for no more than one month. Long-term detoxification with a replacement drug - treatment with decreasing doses of a replacement drug for more than one month. Short-term supportive, i.e., maintenance treatment – treatment with stable doses of the replacement drug for a period of up to 6 months; Long-term supportive, i.e., maintenance treatment – treatment with stable doses of the replacement drug for more than 6 months.

Current drug legislation focuses only on punitive measures and is aimed at restricting supply. The amount of human and financial resources allocated to the repressive component of the policy and forceful measures leads to a sharp imbalance between the punitive and care/help vectors of the anti-drug policy. Strict drug policy complicates the implementation of treatment-rehabilitation and prevention programs. Added to this is the country's insufficient efforts in the direction of prevention and treatment-rehabilitation. In addition, the socio-economic situation of the families of drug users is aggravated by fines imposed by the state, plea agreements, etc.

The abuse of opioids is a topical issue for our country and neighboring countries. This is because the non-medical use of opioid agonists comes with a lot of problems for both the user and society. These problems can be conditionally divided into medical and social. Medical include: direct mortality, the formation of dependence syndrome, an increased risk of contracting blood-borne infections (viral hepatitis, HIV), an increased likelihood of other diseases associated with the route of drug administration (thrombophlebitis, infective endocarditis), diseases associated with a decrease in immunity (tuberculosis and etc.). Social problems can be called problems that are not directly related to the medical consequences of use. These include increased criminal activity (directly drug trafficking itself, as well as acquisitive crimes in order to obtain funds for the purchase of drugs), violations in family and social interaction. All these phenomena lead to significant financial costs for various state and non-state organizations.

The traditional approach to treatment has long been proven to be effective and bring positive results in terms of reduced frequency of drug use, improved employment and fewer crimes committed. However, a common problem in inpatient detoxification and rehabilitation is the high rate of early termination of treatment.

The method of substitution therapy differs significantly from the methods of treatment of opioid dependence described above, the main difference of which is the absence of a requirement for the drug user to completely stop using psychoactive substances, as well as the need to experience the withdrawal syndrome associated with drug withdrawal.

Methadone - one of the first synthetic opioids (the second after meperidine) was synthesized in Germany in 1944 in the process of searching for analgesics that do not have narcoleptic properties. According to its chemical structure, methadone belongs to diphenylheptane derivatives and is a full agonist of opioid receptors. Methadone has a pronounced μ-receptor agonist activity and has a pharmacological profile almost identical to that of morphine. However, the hypnotic effect of methadone is less pronounced than that of heroin and morphine.

Methadone is the first drug to be used in substitution therapy for opioid dependence syndrome. This choice was due to a number of unique properties of methadone. These include: high bioavailability (up to 90%) when taken orally, which avoids injections and delayed elimination (the half-life of methadone is 14-30 hours, and with systematic use, on average, 22

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hours). At the same time, the half-life for morphine fluctuates around 1.9 hours, and for heroin - 30 minutes. This makes it possible to prescribe methadone once a day. It is important to note that oral methadone has almost no euphoric effect.

The effectiveness of opioid substitution therapy has been confirmed by numerous studies and at the moment there is no doubt among specialists in the treatment of addictions. The effect includes a decrease in the prevalence of blood-borne infections and HIV infection among drug users, a decrease in criminal activity and a decrease in unemployment. In our opinion, it is also important to note that participation in methadone substitution therapy, in addition to economic indicators, improves the quality of life of people suffering from opioid dependence syndrome. This has been shown in numerous studies both in our country and in other countries where substitution therapy for opioid dependence is being implemented.

Intensity of Opioid Intoxication and Withdrawal Opioid intoxication (ie, withdrawal) and withdrawal are very important syndromes from a diagnostic point of view. However, we must always remember that the presence of only one of these conditions does not allow us to make a diagnosis of addiction, if they are not confirmed by the presence of other criteria. This is especially true in the state of intoxication, since there may be single or irregular consumption without dependence. When examining a patient, the degree of intoxication and withdrawal should be interpreted based on when the patient last took the drug. The signs of opioid intoxication are mainly the following: euphoric mood, analgesia, narrowing of the pupils, drooping of the eyelids, itching, sedation, somnolence, decreased blood pressure, slowing of the pulse, decreased breathing rate, characteristic speech disorders, etc. The state of opioid withdrawal is a combination of symptoms of different types and severity, which is observed when the psychoactive substance is completely or partially stopped. The onset and duration of withdrawal symptoms is limited to a certain time and depends on the psychoactive substance and its dose, which was taken before stopping or reducing the drug.

Symptoms of an opioid withdrawal state include: dilated pupils, rhinorrhea, lacrimation, drooling, goosebumps, headache, agitation, irritability, restlessness, insomnia, muscle and joint pain, myoclonus, abdominal cramps, vomiting, diarrhea, rapid breathing, increased blood pressure. and pulse delirium. Sometimes there may be room for change of consciousness and heartbreak. Visual inspection: In the initial assessment (which may sometimes be time-poor) the visual inspection is very important. If intravenous administration is noted in the anamnesis, Nanemsars should be visible and consistent with the anamnesis (as a rule, both new and old Nanemsars are visible). Inspection of the injection site can provide useful information about the timing and duration of injection drug use. The last injection site is small and red, sometimes inflamed, or bordered by a small bruise. The old injection site is usually not inflamed, but sometimes it is characterized by a change in pigmentation (darker or lighter), the skin may be atrophic - it looks like a dropped area. In a given period, a patient with neuroadaptation usually has new and old memories. Many sites can be used for injection, but the axillary fossa, the inner surface of the elbow joint, and the groin are the most common injection sites. The presence of trophic ulcers on the skin gives us some information. The effects of local burns, often the result of cigarette smoking during opioid sedation, may be encountered. Also, attention should be paid to tattooing at the injection sites, burns and post-incision skin damage, which may be the result of the patient's attempt to cover the injection marks.

Drug screening of biological fluids if available and financially feasible for the organization, urine (or other biological fluids, eg saliva or blood) should be routinely screened for drugs and

psychotropic substances prior to treatment. In order to be considered eligible for treatment, this test must confirm recent opioid use. When the cost of urinalysis is an issue, it should still be performed when recent opioid use cannot be confirmed otherwise (eg, opioid withdrawal or intoxication). A negative response to a urine drug screening test and the absence of withdrawal symptoms rule out the presence of neuroadaptation to opioids at this stage; However, this does not exclude opioid dependence in the past 12 months. Thus, the diagnosis of addiction should not be made solely on the basis of the result of a urinalysis, but a negative test for the presence of drugs in the urine and the absence of withdrawal symptoms question the use of opioids and other sedative drugs. Urinalysis, along with history, is also useful in identifying other recent substance abuse. In order to start the appropriate treatment, one should not wait for the result of the urine test, if other already available data strongly indicate the diagnosis. Routine use of the naloxone test to confirm neuroadaptation is not appropriate because it can induce a strong inhibitory state effect. Usually, the same information can be obtained by taking the patient's history, examining the patient, and interpreting the urinalysis. Before starting the treatment, the patient should undergo the following tests: General blood analysis, determination of glucose in the blood, determination of narcotic/psychotropic substances in urine (or other biological fluid), electrocardiography, It is also recommended, although in standard cases, it is not mandatory to conduct the following examinations: General analysis of urine;, Determination of transferases in the blood; determination of bilirubin in the blood, determination of prothrombin time in blood; Immunoserological examinations of viruses (HIV, hepatitis B, hepatitis C). At the doctor's discretion, the patient may be assigned additional examinations or specialist consultations. It is desirable that the institution has the possibility to conduct the mentioned examinations. Otherwise, he should be required to conduct the above-mentioned examinations in a competent institution and present the results to the substitution therapy unit. A pregnancy test should be offered to all women, so that in case of a positive answer, appropriate treatment tactics can be selected. It is recommended that all patients be counseled and, if necessary, tested for HIV infection and hepatitis B and C.

Neurobiological aspects of opioid addiction regular use of opioids causes neuroadaptive reactions in various brain neurons involved in motivation, memory, behavior control and disinhibition processes. Over the past decade, knowledge about the neurobiological aspects of drug addiction has grown significantly. Certain brain structures are known to play an important role in regulating pleasure-related behaviors. Neuronal pathways leading to and from these areas form the so-called "Circles of feedback". They are located in the mesocorticolimbic dopamine systems that originate in the ventral tegmental areas and project to the Nucleus Accumbens, the amygdala, and the prefrontal cortex. The different opioid receptors emerged, and further pharmacological studies identified three classes of opioid receptors, namely the mu, delta, and kappa receptors. Opioid receptors belong to the G protein-coupled receptors, and each receptor class includes several subtypes. Opioid effects of analgesia, euphoria and sedation are predominantly mediated by mu receptors. Opioids indirectly induce dopamine release by reducing gamma-aminoerbic acid (GAM) inhibition via mu receptors in the ventral tegmental area. They also directly induce dopamine release by interacting with opioid receptors in the nucleus accumbens. The effects of chronic opioid exposure on human opioid receptors are not well understood. Tolerance develops through multiple mechanisms, including acute desensitization of the opioid receptor (which develops within minutes of opioid use and resolves within hours of use) and long-term opioid receptor desensitization (which persists for several days after opioid agonist withdrawal). Changes

are also observed in the number of opioid receptors - in particular, there is a compensatory up-regulation of cyclic adenosine monophosphate (cAMP).When an opioid is withdrawn, the cAMP cascade is hyperactivated, leading to a "noradrenergic storm" that manifests clinically as a state of opioid withdrawal and thus creates a motivation to resume taking the drug. Long-term changes in neuronal circuitry similar to those seen in learning and memory are observed with regular opioid use. This effect leads to a high risk of relapse to opioid use, even after a long-term abstinence state.

Ethical principles in accordance with the right to self-determination and the attainment of the highest possible standard of health as defined in Article 12 of the International Covenant on Economic, Social and Cultural Rights, a person should have the right to freely choose whether or not to participate in treatment. WHO's Mental Health, Human Rights and Law Resource Book states that for consent to be valid, it must meet the following criteria: The person/patient giving consent must be competent to do so; Competence is assumed unless otherwise stated; Consent must be obtained independently, without threats or undue pressure; It is necessary to provide information accordingly and adequately. We must provide information about the purpose, method, expected duration and expected benefits of the proposed treatment; About the possible pain and discomfort and the risk of the proposed treatment, as well as the side effects. This information should be discussed with the patient; According to good clinical practice, if possible, the patient should be offered a choice of alternative treatment methods, especially less invasive ones; Information should be provided in a language that is understandable to the patient; The patient must have the right to refuse treatment or stop treatment; Consequences of refusing treatment should be explained to the patient, which may include discharge from the hospital; Consent must be documented in the patient's medical records; The right to consent to treatment implies that there is also the right to refuse treatment. If we believe that the patient has the capacity to give consent, we must respect his decision even if he does not give consent.

In addition to the pathological risk of allergy to heart failure patients, extremely risky behavior may put them at even greater risk during a pandemic. Accidental deaths associated with substance use disorders are significantly higher compared to the general population across all categories, including age, gender, income, and education, and the relative risk of occurrence is notable among women. People with multiple alcohol, drug and tobacco use disorders appear to be at particularly high risk of developing them. The people with substance use disorders are susceptible to serious health complications, including chronic infections, a compromised immune system, various respiratory, cardiovascular and metabolic diseases as well a number of secondary diseases comorbidities. Although they experience stigma and marginalization due to limited access to health care, the difference in perceived danger and risky prescription can result in a higher mortality rate for people with substance use disorders. Due to the particular nature of substance use disorders and COVID-19 research, the group is also seeking guidance for large companies and policymakers regarding the comorbidity of COVID-19 infections.

Conclusion

The main drugs used to treat opiate addiction in adolescents are similar to those used in adults, mainly methadone and buprenorphine. Both drugs can be used to support abstinence lasting several weeks or months. They can also be used for long-term stabilization and for maintenance and inspection times. The conditions for dose induction and titration can be at home or in a day clinic. This depends on the age of the child/teen, the severity of the addiction and other factors

such as the impact of mental health issues, other medications used, and family/social support. All of these drugs must be administered under supervision. As with adults, thorough assessment of addiction by competent groups, including toxicologists, is required. Attention should be paid to the initial tolerance, as it is not always so pronounced in young people. Dose induction and titration are similar to adults, but care should be taken to start with the daily loading dose and initial escalation, usually beginning with a lower dose (eg, less than 30 mg methadone per day or less), taking into account the age and physique of the child/adolescent, but also knowledge of signs of tolerance and intoxication or continued drug withdrawal. Caution is advised, but introducing too little methadone too slowly can also lead to further illicit heroin use, for example with additional risks. These problems can be solved by providing the young person with very thorough information, with the guarantee of frequent examinations in order to adjust the treatment if necessary. For people addicted to prescription opioids such as tramadol or over-the-counter opioids, there is little evidence to guide drug selection. Clinical practice includes the use of buprenorphine replacement therapy or the use of the originally prescribed drug at reduced doses. Clinical consensus suggests that stabilization with a long-acting replacement drug such as buprenorphine may be more beneficial, when appropriate, to allow time to assess all other needs, fully involve the young person and their family, and develop and implement a plan of care. However, this can be addressed on a case-by-case basis by monitoring stabilization (avoiding ups and kickbacks). The length of the stabilization phase and duration of detoxification depend on clinical risk, severity of addiction, use/dependence on other drugs or alcohol, social functioning, mental health issues, marital status, and criminal behavior.

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CHOICE OF A RATIONAL LOCATION OF OIL WELLS, ACCORDING TO THE INFLUENCE OF THE EARTH'S MAGNETIC FIELD

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ABSTRACT

The paper studies the process of oil displacement from a porous medium located along the geographic poles of the planet Earth. Physical modeling of the process of oil displacement from a porous medium is carried out in laboratory conditions. In this case, it is necessary to fulfill the following conditions, which are dictated by the laws of Physics:

1. It is known that the intensity of the Earth's magnetic field varies in time and from the position on the surface of the planet. It follows that when modeling the process of oil displacement from reservoir models, it is necessary to perform an action for all models simultaneously in the same place!
2. When modeling reservoir conditions of oil occurrence, it is necessary to create high pressures inside the reservoir model. To fulfill this condition, the porous medium is placed in a metal container called a column and must pass the magnetic force field. The column should not be a screen for the Earth's magnetic force field - it can be any materials that can withstand high pressures and pass a magnetic field through them. In these experiments, brass tubes were used.
3. The geometric parameters for all reservoir models and the composition of the porous medium, oil and water displacing oil should be the same.

The article explores another important issue.

Typically, in the laboratory, reservoir simulation columns are made of steel pipes, which act is a screen for the magnetic field. Very often, the results obtained in the laboratory are very different from the oil field values. We assumed that such a discrepancy is possible due to the fact that the influence of the Earth's magnetic field is not taken into account when modeling reservoir conditions in the laboratory. To test this, it was decided in the laboratory to four brass columns, to connect two more metal columns identical in geometry to brass columns and a porous medium, oil.

The experiments were carried out on a standard setup according to the procedure given in [1]. Piping of the experimental setup was carried out in such a way that the displacement process in all

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six columns (two steel and four brasses) occurred simultaneously (Fig. 1). The results of the experiment are presented in table 1.

From Table 1 it follows that the final oil displacement ratio in the South-North direction; South – North (with screen); East – West; West – East (with screen) are within 0, 60. In the direction North – South and West – East, the final oil displacement coefficient is within 0, 40.

It follows that if oil is displaced by water in real reservoir conditions, other things being equal, in the directions South – North; East – West, it is possible to increase oil production by 20% without additional material costs [1].

These results were obtained for wells located in the Northern Hemisphere of the planet Earth. The question arose: will the obtained pattern be preserved for wells located in the Southern Hemisphere of planet Earth?

Using the data of the experiment [1], applying the graphic-analytical method of processing the results of the experiment, the question posed was studied. As you know, in reality, the shape of the planet Earth is closer to an ellipsoid oblate from the poles. In the first approximation, one can consider the model of the planet Earth as a ball; such an approximation is often used in astronomy to illustrate the Earth's magnetic field lines.

On plane composed by the axes: South → North and West → East this is a circle.

From the center of the circle along the axes indicated above, on a certain scale, the value of the coefficient oil displacement is plotted. The vectors South → North with East → West and West → East with North → South are summarized. The two obtained vectors, taking into account the experimental error and the assumptions made above the model of the planet Earth, satisfactorily lie on the axis of the Earth's magnetic pole.

Hence follows:

1. The Earth's magnetic field significantly affects the process of oil displacement from a porous medium.
2. The maximum displacement of oil from the rock under the influence of the Earth's magnetic field is observed in the direction along axis from South to North and from East to West.
3. The trend towards an increase in the oil displacement coefficient from the porous medium from the South → to the North along the axis of the Earth's magnetic pole remains in both the Northern and Southern Hemispheres of the Earth.

Introduction

In the 90s of the last century, a number of scientists received the USSR State Prize for explaining the phenomenon of increasing the productivity of production wells located from South to North. Chief Geologist of Production Association "Tatneft" Muslimov R. Kh. and others explained this phenomenon by the pulsation of the Earth's poles relative to the equator in the process of its rotation along the ecliptic around the Sun. This approach has the right to exist!

Our studies have shown that the filtration rate and the displacement of hydrocarbon liquids in a porous medium are significantly affected by the magnetic field of the planet Earth. The degree and nature of the influence of the magnetic field on the processes of mass transfer have been studied in various media by various authors. Since oil is displaced from the reservoir during oil production, we studied the effect of the magnetic field on the process of hydrocarbon displacement from the porous medium.

The question arises why, out of the whole range of physical fields (magnetic, electric, ultrasonic, thermal, etc.), one of them is preferred? The fact is that the magnetic field has a number of unique

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properties that put it in the first positions. So, with a low energy consumption of the magnetic field itself, an effect is obtained in terms of energy capabilities that exceed it by a multiple of times.

It is known that a magnetic field can, for example, reduce the swelling of clay particles in a medium [2]. A similar effect can be obtained through the use of chemical reagents, however, this requires significant costs and, in addition, in terms of the effect on the formation, the magnetic field is environmentally preferable. Thus, these features are serious prerequisites for the protection of Nature and the creation of resource-saving technologies.

The study of the influence of a magnetic field on the process of displacement of hydrocarbons from a porous medium showed a significant increase (up to 30%) in the displacement coefficient, see [2] for details. Such a significant increase in the displacement efficiency was initially explained by the removal of swelling of clay particles. However, the process of increasing the efficiency of displacement in reservoir conditions is observed, in a relatively small amount, in sandy and carbonate reservoirs. Therefore, the increase in the efficiency of oil displacement by water treated with a magnetic field cannot be explained only by a decrease in the swelling of clay particles. Additional laboratory studies were carried out on the displacement of oil from sandy, clay and carbonate porous media with magnetized water. These studies revealed the presence on the surface of porous media of the smallest minerals (Nano-particles) of the goethite type, which have magnetic properties. Thus, with the artificial imposition of an external magnetic field, the effect of ferromagnetic particles is compensated, which entails an increase in the displacement coefficient.

However, these studies, with all their positivity, exclude one important circumstance that the Earth itself is a magnet, so its effect must be taken into account.

Purpose of the study

The purpose of this work: 1) to study the influence of the strength of the natural magnetic field of the Earth on the processes of displacement of hydrocarbon liquids by water at different spatial orientations (displacement was carried out in the direction of the geographic poles).

2) To establish the reasons for the discrepancy between the experimental data obtained in the laboratory and oil field data.

3) To study whether the trend of increasing the oil displacement efficiency from the porous medium from the South → to the North is preserved, both in the Northern and Southern hemispheres of the Earth.

Ways to implement the study.

The studies were carried out by physical modeling of the process of displacement of oil from a porous medium by water in the laboratory. In laboratory conditions, studies on the displacement of oil from the rock are carried out in steel columns, which are a screen for the Earth's magnetic field. Therefore, the results of studies in steel columns do not reflect the real conditions of the reservoir, since the influence of the Earth's magnetic field is not taken into account. It is known that brass is a diamagnetic through which a magnetic force field passes. Therefore, laboratory experiments of the complex impact of the Earth's magnetic field were carried out on reservoir models placed in brass pipes.

Strictly speaking, since the influence of the strength of the natural magnetic field of the Earth is being studied, it is necessary to take the axis of the magnetic field as the reference frame. Since the position of the magnetic axis drifts in time, the determination of its position is carried out by

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astronomical methods. In order not to perform a complex and expensive procedure for determining the Earth's magnetic axis, which would also introduce an error in measurements, the direction of oil displacement by water was carried out along fixed and generally recognized geographical poles (North, South, East and West).

Very often, the results obtained in the laboratory are very different from the oil field values. We assumed that such a discrepancy is possible due to the fact that the influence of the Earth's magnetic field is not taken into account when modeling reservoir conditions in the laboratory. To test this, it was decided in the laboratory to add two more metal columns to four brass columns, identical in geometry with brass columns and a porous medium, and oil. At the same time, one metal column with a reservoir model was directed from South to North (with a screen), and the other - from West to East (with a screen).

Method of the Experiment

The experiments were carried out on a standard setup according to the procedure given in [1, 2]. Piping of the experimental installation was carried out in such a way that the process of oil displacement in all six columns (two steel and four brass) occurred simultaneously (Fig. 1).

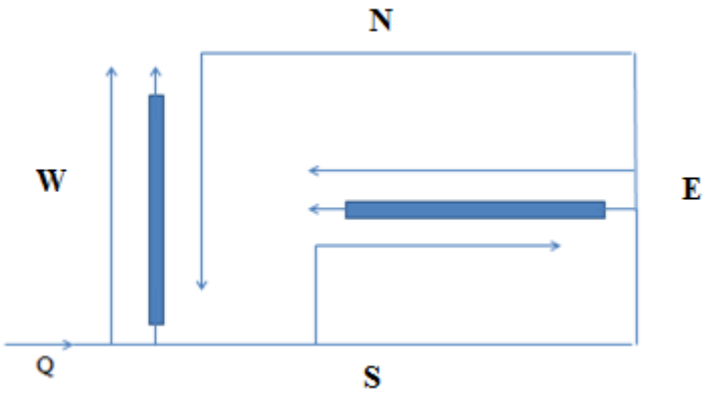

Figure 1. Scheme of the experimental setup.

This important circumstance is due to the fact that the Earth's magnetic field during the day changes not only in direction, but also in strength. Simultaneous displacement oil eliminates the influence of fluctuations in the magnitude of the Earth's magnetic field over time, and therefore the obtained values can be compared and analyzed. The results of the studies are shown in Figures 2, 3 and Table 1. From the analysis of the curves for the displacement of hydrocarbon liquids by water under the influence of the Earth's magnetic field (brass column) and without its influence (steel column), the following values of the coefficient of final and anhydrous displacement were obtained.

Analysis of the obtained results

From Figure 2 it follows:

a) When oil was displaced from the South to the North, the final recovery factor was 0.58, and the waterless period was 0.29 (the first line of Table 1);

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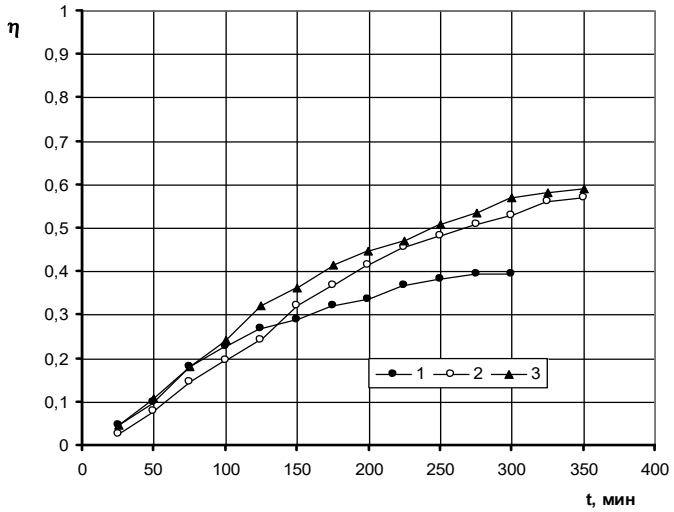
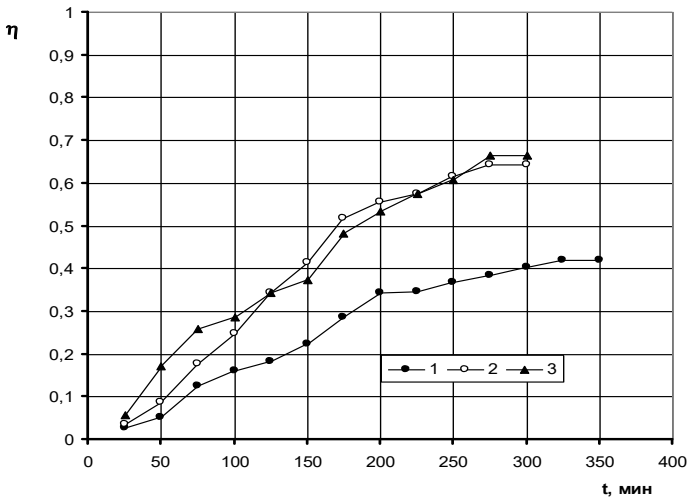
b) When oil was displaced from the North to the South, the final recovery factor was 0.40, and the waterless period was 0.15 (second line of Table 1);
c) When oil was displaced (from a shielded column, without the action of the Earth's magnetic field) from the South to the North, the final recovery factor was 0.59, the anhydrous period was 0.34 (third line of Table 1).



1. North – South; 2. South – North; 3. South – North (from a shielded column).
Figure 2. The dependence of the oil recovery factor in time on the direction of displacement.



1. West – East; 2. East – West; 3. East – West (from a shielded column).
Figure 3. The dependence of the oil recovery factor in time on the direction of displacement.

From Figure 3 it follows:
a) when oil was displaced from East to West, the final recovery factor was 0,65, and the waterless period was 0,15 (fourth line of Table 1).

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b) when oil was displaced from West to East, the final recovery factor was 0,42, the waterless period was 0,14 (fifth line of Table 1).
c) when oil was displaced (from a shielded column, without the action of the Earth's magnetic field) from East to West, the final recovery factor was 0,67, the anhydrous period was 0,34 (sixth line of the Table 1).
The obtained values of the final and anhydrous oil displacement efficiency are summarized in Table 1.

Table 1.

Displacement direction	Final recovery factor	Anhydrous recovery factor
The South to the North	0,58	0,29
The North to the South	0,40	0,15
The South to the North (from a shielded column)	0,59	0,34
The East to the West	0,65	0,15
The West to the East	0,42	0,14
The East to the West (from a shielded column)	0,67	0,34

From Table 1 it follows that the final oil displacement ratio in the South – North direction; South – North (from a shielded column); East – West; East – West (from a shielded column) are within 0,60. In the direction North-South and West-East, the final displacement coefficient of the oil is within 0,40. It follows that if oil is displaced by water in real reservoir conditions, other things being equal, in the directions South – North; East – West can be extracted additionally up to 20% from the total oil reserves without additional material costs!
This result can also serve as a guide when calculating the optimistic value of the final recoverable oil reserve at the design stage of the master plan for the development of new fields!
The coefficient of final oil displacement from the screened columns South – North and East – West is, considering the experimental error, within the maximum value. While, the value of the final oil displacement factor in real conditions is 20% lower. Therefore, in laboratory modeling of reservoir conditions, it is necessary to consider these discrepancies. The importance of this result lies in the fact that, in addition to the fact of establishing the priority direction of displacement, it also explains the reason for the discrepancy, in most cases, between the results of laboratory and field studies: not considering the influence of the Earth's magnetic field in laboratory modeling of the displacement process in real conditions.
As an example confirming the influence of the Earth's magnetic field on the growth of oil production in wells located to the north relative to each other, one can cite a fragment from the book [3]. “... Considering the geological factors that determine the saturation pressure of oil deposits confined to the Valonzhin and Goterivbarrem deposits in the fields of the Surgut and Nizhnevartovsk arches, one can establish a trend towards an increase in gas content, and, consequently, gas factors and saturation pressure in the North direction up to the appearance of gas caps in individual horizons..." This information is consistent with our studies showing the effect of a magnetic field on the saturation pressure of a gas-oil mixture [2]. At the same time, with an increase in the magnetic field strength, an increase in saturation pressure occurs.

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To establish the direction and trend in the behavior of the coefficient of oil displacement from a porous medium, according to the geographic poles in the Southern Hemisphere of the Earth, we will use the analysis of the results obtained by the graphical-analytical method (Figure 4,5).

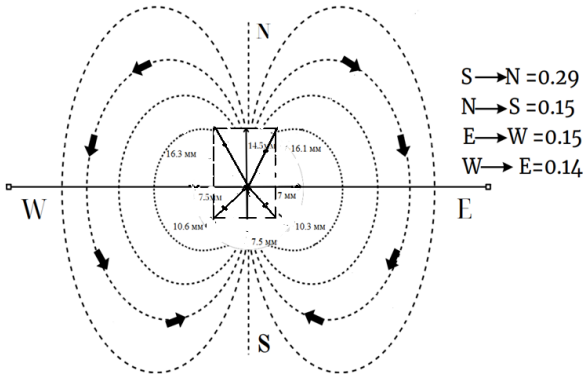

Figure 4. The location of the values of the anhydrous oil recovery coefficient by water along the geographic poles of the Earth.

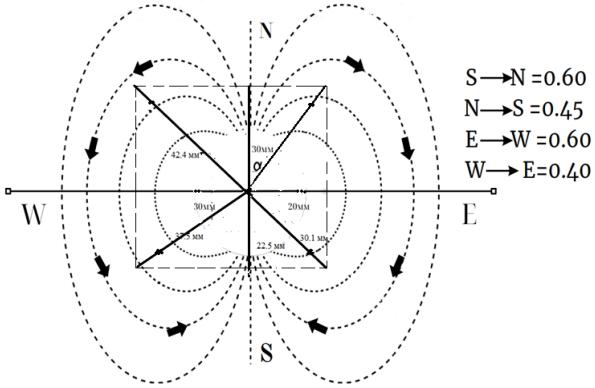

Figure 5. The location of the values of the final oil recovery factor when displaced by water along the geographic poles of the Earth.

1. Construct a circle, draw two perpendicular lines through the center until they intersect with the circle. These lines correspond to the geographic poles of the Earth.
2.From the center of the circle (0) along the axes ON; OS; OW; OE let us plot on a scale the dimensionless values of the final displacement coefficients for oil (0.58; 0.40; 0.65; 0.42 Fig. 5) and anhydrous (0.29; 0.15; 0.15; 0.14 Fig. 4).
3. Let's sum the adjacent two vectors and get four vectors (R_{NE}; R_{ES}; R_{SW}; R_{WN}).
4. Let's determine the magnitude of the angles between the resulting forces and the geographic axes.
From Figure 4 it follows that the angle between the direction of the north geographic pole ON and R_{NE} is 23^{O}, which corresponds to the angle between the direction of the Earth's magnetic axis and the axis of the North geographic pole. It should be noted that the axis of the Earth's magnetic field

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drifts around the geographic North Pole, describing a conical surface. The apex of the cone is in the center of planet Earth. The cone completes a full revolution in about a hundred years. Considering that the shape of planet Earth is an ellipsoid, the angle between the direction of the Earth's magnetic axis and the axis of the North geographic pole varies over time in the range from $10^{O} – 23^{O}$ 30´.

Conclusions

1. Summarizing the above results, the phenomenon of increasing productivity of production wells located from South to North can be explained by the action of the Earth's magnetic field.
2. The discrepancies between experimental data obtained in the laboratory and field data are explained as follows. Laboratory modeling of reservoir conditions for hydrocarbon occurrence does not consider the effect of the Earth's magnetic field.
3. Graph-analytical analysis showed that the direction and trend of increasing the coefficient of oil displacement from a porous medium from South → to North, both in the Northern and Southern Hemispheres of the Earth, remains the same. However, the quantitative value of the final oil recovery factor when displaced by water must be carried out in a laboratory in the Southern Hemisphere of the Earth, according to the method [1, 2].

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DATA FUSION OF ULTRASONIC SENSORS FOR DISTANCE MEASUREMENT

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ABSTRACT

Distance measurement plays a fundamental role in contemporary technology, exerting a significant influence on applications across a myriad of sectors, ranging from autonomous navigation and industrial automation to robotics. Ultrasonic sensors, celebrated for their simplicity, cost-efficiency, and adaptability, have grown into essential instruments for gauging distances. Nevertheless, individual ultrasonic sensors are not exempt from constraints, which encompass inaccuracies stemming from environmental conditions, sensor noise, and measurement errors. This article delves into the advanced practice of data fusion, a method that entails amalgamating data from multiple ultrasonic sensors, bolstered by intricate algorithms like artificial intelligence (AI) and statistical techniques. The fusion of ultrasonic sensor data surpasses mere amalgamation; it harnesses the potency of AI to refine data integration. Consequently, this doesn't only enhance measurement precision but also equips systems to function dependably in dynamic and demanding environments. The article explores the importance of ultrasonic sensors, the necessity for data fusion, procedures for data preprocessing, the extraction of relevant features, the application of fusion algorithms, and the handling of uncertainties. It investigates the utilization of ultrasonic sensor data fusion in diverse domains such as autonomous vehicles, robotics, industrial automation, healthcare, and environmental monitoring. Moreover, it confronts issues associated with data quality, environmental variations, privacy concerns, and ethical deliberations. The article concludes by shedding light on the encouraging avenues that lie ahead in the field, which include the development of advanced algorithms, the seamless integration of different sensor types, real-time data processing, and a strong emphasis on safety-critical applications. Data fusion from ultrasonic sensors signifies an evolving and transformative technology with profound consequences for various sectors. The responsible advancement and deployment of this technology are of paramount importance to ensure the realization of its full potential, while maintaining the principles of safety, ethics, and reliability in a continuously evolving technological landscape.
Keywords: Complex measurement, Multi-sensor distance measurement, Ultrasonic sensors, Data fusion, Measurement accuracy.

XÜLASƏ

Məsafənin ölçülməsi müasir texnologiyada mühüm rol oynayır və avtonom naviqasiya və sənaye avtomatlaşdırmasından robototexnikaya qədər saysız-hesabsız sektorlardakı tətbiqlərə əhəmiyyətli təsir göstərir. Sadəliyi, iqtisadi səmərəliliyi və inteqrasiya qabiliyyəti ilə məlum olan ultrasəs sensorları məsafələri ölçmək üçün vacib vasitələrə çevrilmişdir. Bununla belə, ultrasəs sensorları ətraf mühitin təsirlərindən, küylərdən və ölçmə xətalarından qaynaqlanan qeyri-dəqiqlikləri əhatə edən məhdudiyyətlərdən azad deyildir. Bu məqalədə, süni intellekt və statistik üsullar kimi

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mürəkkəb alqoritmlərlə optimallaşdırılmış çoxsaylı ultrasəs sensorlarından əldə edilmiş verilənlərin aqreqasiyasını nəzərdə tutan üsul və vasitələr tədqiq edilmişdir. Məqalədə verilənlərin inteqrasiyasını optimallaşdırmaq üçün süni intellektin potensialından istifadənin imkanları nəzərdən keçirilmişdir. Nəticə etibarilə, süni intellektli aqreqasiya təkcə ölçmənin dəqiqliyini artırmır, həm də sistemləri dinamik mühitlərdə etibarlı şəkildə işləmək üçün təchiz edir. Məqalədə ultrasəs sensorlarının əhəmiyyəti, verilənlərin aqreqasiyanın zərurəti, verilənlərin əvvəlcədən işlənməsi prosedurları, müvafiq xüsusiyyətlərin çıxarılması, birləşmə alqoritmlərinin tətbiqi və qeyri-müəyyənliklərin idarə edilməsi araşdırılmışdır. Avtonom nəqliyyat vasitələri, robototexnika, sənaye avtomatlaşdırması, səhiyyə və ətraf mühitin monitorinqi kimi müxtəlif sahələrdə ultrasəs sensorlu verilənlərin aqreqasiya modellərinə baxılmışdır. Bundan əlavə, verilənlərin keyfiyyəti, ətraf mühit dəyişiklikləri, məxfilik problemləri və etik müzakirələrlə bağlı məsələlər ələ alınmışdır.

Açar sözlər: Kompleks ölçmə, Çoxsaylı sensorlarla məsafənin ölçülməsi, Ultrasəs sensorlar, verilənlərin aqreqasiyası, Ölçmə dəqiqliyi

Introduction

Distance measurement is a fundamental and ubiquitous task in today's technological landscape. It serves as the foundation for numerous applications across a multitude of domains, ranging from autonomous navigation and industrial automation to robotics and environmental monitoring. Accurate distance measurements not only provide a critical understanding of spatial relationships but also serve as the basis for informed decision-making and action. Within this expansive realm of distance measurement, ultrasonic sensors have emerged as invaluable tools, renowned for their simplicity, cost-effectiveness, and adaptability. These sensors operate on the principle of emitting high-frequency sound waves and measuring the time it takes for these waves to return after striking an object, subsequently converting this time-of-flight measurement into a distance reading. However, like any technology, individual ultrasonic sensors are not devoid of limitations. Variabilities in environmental conditions, such as temperature, humidity, and air pressure, can influence the speed of sound, thereby introducing uncertainty into the time-of-flight measurements. Signal noise, which can result from factors like electronic interference or sensor limitations, further compounds the complexity of accurate distance estimation. In recognition of these inherent challenges, the need for robust and precise distance measurements has prompted the exploration of advanced techniques to enhance the capabilities of ultrasonic sensors. One such technique that has come to the forefront is the fusion of data from multiple ultrasonic sensors. Data fusion transcends the mere aggregation of measurements; it harnesses the power of sophisticated algorithms, including artificial intelligence (AI) and statistical methods, to optimize information integration. The fusion of ultrasonic sensor data goes beyond mere redundancy, offering enhanced accuracy and reliability [1-6]. It empowers systems to operate reliably in dynamic and challenging environments, where safety is paramount. By fusing measurements from multiple sensors, the risk of collisions and accidents in applications such as autonomous vehicles, robotics, and industrial automation is significantly reduced. This article delves into the multifaceted realm of data fusion for ultrasonic sensors, shedding light on its significance, techniques, and applications. It explores the journey from the strengths of ultrasonic sensors to the need for data fusion, addressing data preprocessing, feature extraction, fusion algorithms, and the intricate realm of uncertainty handling. The article also investigates the wide array of applications where ultrasonic sensor data fusion plays a pivotal role, from the realm of autonomous vehicles to

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healthcare and environmental monitoring. Moreover, it examines the challenges and ethical considerations associated with data quality, environmental variability, privacy, and safety in the context of data fusion. As technology continues to evolve, the article concludes by highlighting promising future directions, including advanced algorithms, seamless sensor integration, real-time processing, and a focus on safety-critical applications. The fusion of data from ultrasonic sensors represents a transformative technology with profound implications for diverse industries. By combining data from multiple sensors, enhanced by advanced algorithms and robust uncertainty handling techniques, distance measurements become more accurate, reliable, and adaptable to diverse environmental conditions. The responsible development and deployment of data fusion technologies, with a focus on safety, ethics, and reliability, will play a pivotal role in shaping the future of autonomous navigation, robotics, healthcare, and environmental monitoring, among other domains.

Objective

The aim of this article is to offer an in-depth comprehension of the importance of utilizing data fusion with ultrasonic sensors for distance measurement. It seeks to function as a valuable resource for researchers, engineers, and professionals operating in this domain, with the ultimate goal of furthering the progress and conscientious utilization of this technology across diverse industries.

Methods

Ultrasonic sensors present a straightforward yet highly efficient approach to distance measurement. They emit sound waves at a high frequency and gauge the time it takes for these waves to return. This time-of-flight measurement is subsequently transformed into a distance reading. The merits of ultrasonic sensors encompass non-contact measurement, versatility with various materials, resilience in diverse environmental conditions, and cost-effectiveness.

The Necessity for Data Fusion- While individual ultrasonic sensors yield valuable distance measurements, combining their data offers numerous advantages, especially in intricate real-world situations.

- Enhanced Precision. Data fusion entails the cross-verification of data from multiple sensors. This means that inaccuracies and measurement errors from individual sensors can be identified and mitigated, resulting in more precise distance measurements. When multiple sensors concur on a distance measurement, confidence in the accuracy of the result is significantly bolstered [7-12].
- Augmented Dependability. In dynamic settings where obstacles can move, change shape, or become obscured, data fusion facilitates a more dependable and continuous distance measurement. This is crucial for applications such as autonomous vehicles or robotics, where safety is paramount. By consolidating measurements from multiple sensors, the risk of collisions and accidents is notably diminished.
- Broader Coverage. Through the amalgamation of data from multiple sensors, the coverage area expands, delivering a more comprehensive perspective of the surroundings. In environments characterized by intricate structures or situations where objects may be located at varying distances, this expanded coverage proves invaluable. For instance, in the context of autonomous vehicles, data fusion can provide a 360-degree view of the surroundings, leading to enhanced situational awareness and safety.

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-Adaptability. Data fusion techniques can be tailored to adapt to diverse environmental conditions, including variations in temperature, humidity, and air pressure. This adaptability ensures that precise distance measurements can be obtained under various circumstances.

Techniques for Data Fusion with Ultrasonic Sensors. Data fusion using ultrasonic sensors involves a multistep process encompassing data preprocessing, feature extraction, fusion algorithms, and uncertainty management [13-15].

-Data Preprocessing. Before fusion can occur, it is imperative to prepare the data from individual sensors. This entails tasks such as data cleansing, standardization, and alignment. Data preprocessing serves to standardize the data and ensure that it is in a consistent format suitable for analysis.

- Feature Extraction. In many data fusion scenarios, it is necessary to translate data from various sensors into a common feature space. This feature-level fusion is vital for amalgamating diverse data types into a unified representation. For example, when consolidating data from different ultrasonic sensors, the output may be converted into a unified distance measurement.

- Handling Uncertainty. Effectively managing uncertainty is a pivotal aspect of data fusion, particularly when amalgamating measurements from multiple ultrasonic sensors. Each sensor may introduce varying levels of uncertainty due to factors such as environmental conditions, sensor quality, and signal noise. Consequently, a comprehensive framework for addressing uncertainty is indispensable for achieving dependable and precise distance measurements. Uncertainty in ultrasonic sensor measurements can be attributed to several factors, including:

- Environmental Variability. Environmental conditions, such as temperature, humidity, and air pressure, can influence the speed of sound. This variance introduces uncertainty into time-of-flight measurements, impacting the accuracy of distance estimates.

- Sensor Quality. Not all ultrasonic sensors are created equal. Disparities in sensor quality and manufacturing standards can result in variations in measurement accuracy. It is imperative to quantify and rectify this inherent uncertainty in sensor quality during the fusion process.

- Signal Noise. Analogous to other sensor types, ultrasonic sensors are susceptible to signal noise. This noise can emanate from electronic interference, reflections, or sensor constraints. Addressing noise and its correlated uncertainty is an intrinsic facet of data fusion.

- Quantifying Uncertainty. Precisely quantifying uncertainty is a pivotal step in data fusion. Uncertainty can be articulated through statistical measures such as standard deviations or confidence intervals. Each measurement is assigned a corresponding uncertainty value, reflecting the level of confidence in the measurement's accuracy. Fusion Algorithms for Uncertainty Handling Diverse fusion algorithms are harnessed to manage uncertainty in ultrasonic sensor data:

- Kalman Filters. Kalman filters are widely adopted in sensor fusion to predict states and curtail uncertainty. These recursive algorithms forecast the current state of a system based on preceding measurements, continually refining predictions as new data becomes available. Kalman filters can substantially bolster the accuracy of distance measurements by considering and improving the estimation.

- Bayesian Network. Bayesian networks provide a probabilistic framework for modeling uncertainty. By delineating the relationships between variables and integrating prior knowledge, Bayesian networks can model and convey uncertainty in intricate sensor fusion scenarios.

- Weighted Averaging. Weighted averaging is a straightforward yet efficacious technique for accommodating uncertainty. Each sensor's measurement is assigned a weight contingent on its

perceived reliability. The fusion algorithm combines measurements by granting more significance to sensors with lower uncertainty.

-Managing Dynamic Uncertainty. In dynamic scenarios, like moving objects or fluctuating environmental conditions, uncertainty is not static but fluctuates. Data fusion algorithms need to adapt to these dynamic uncertainties by continually fine-tuning the fusion process based on evolving conditions.

-Real-time Uncertainty Estimation. Real-time uncertainty estimation is indispensable, especially in applications necessitating immediate decision-making. Fusion algorithms must supply not only distance measurements but also real-time estimates of associated uncertainty. This enables the system to make informed decisions while accounting for the level of confidence in the data.

-Decision-Making Based on Confidence. In safety-critical applications, the confidence in data assumes a decisive role in decision-making. If uncertainty surpasses a predetermined threshold, the system may opt for cautious actions or seek supplementary information. Fusion algorithms can incorporate decision-making logic founded on confidence to ensure prudent and secure system operation.

- Continuous Learning. Data fusion of ultrasonic sensor data is an ongoing process. Over time, the system can acquire knowledge from new data and adjust to evolving conditions, thereby fine-tuning uncertainty management strategies. Machine learning techniques can aid in improving the system's capacity to adapt and diminish uncertainty in real-time.

- Addressing Uncertainty. Dealing with uncertainty is an essential component of data fusion. Different sensors may possess varied levels of reliability and precision. Fusion algorithms frequently include mechanisms for quantifying and managing uncertainty. This is crucial for accurately conveying confidence in the ultimate distance measurements. Uncertainty management also facilitates the provision of meaningful error estimates, which can be particularly valuable in critical applications involving safety and risk assessment.

Applications of Ultrasonic Sensor Data Fusion. The fusion of data from ultrasonic sensors has a wide array of practical applications in various domains. Some notable examples include:

-Autonomous Vehicles. In the realm of autonomous vehicles, amalgamating data from multiple ultrasonic sensors is of utmost importance for ensuring safety and dependability. These sensors empower the vehicle to identify and respond to obstacles, pedestrians, and other vehicles, even in adverse weather conditions.

- Robotics. Robots, especially those employed in environments involving human interaction, necessitate precise distance measurements to navigate and execute tasks securely. The fusion of ultrasonic sensor data enhances their capacity to operate effectively in ever-changing environments.

-Industrial Automation. Manufacturing and industrial settings frequently deploy robots and automated systems that must accurately perceive their surroundings to perform tasks with efficiency and safety. The amalgamation of ultrasonic sensor data contributes to the reliability and adaptability of these systems.

-Healthcare. In the healthcare sector, ultrasonic sensor data integration serves various purposes, including medical imaging and diagnostic equipment. The combination of data from different sensors amplifies the precision of medical diagnoses and recommendations for treatment.

- Environmental Monitoring. Environmental monitoring heavily relies on precise distance measurements for applications like climate monitoring, agriculture, and geospatial mapping.

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Ultrasonic sensor data integration plays a pivotal role in enhancing measurement accuracy in these contexts..

Challenges and Ethical Considerations

While combining data from ultrasonic sensors offers numerous advantages, it is not devoid of obstacles and moral considerations.

- Data Quality. The quality of information from individual sensors is a fundamental element in the triumph of data fusion. Sensors must undergo accurate calibration, and data from different sensors should consistently demonstrate reliability. Ensuring the reliability of the combined data necessitates calibration methods and quality control processes.
- Environmental Variability. Environmental factors, including temperature, humidity, and air pressure, can influence the speed of sound, thereby affecting the precision of ultrasonic measurements. Techniques for combining data must be designed to accommodate these variations and provide precise and robust estimates of distance.
- Privacy and Security. The integration of data from multiple sensors can raise privacy concerns in applications like surveillance or healthcare. In such contexts, safeguarding data privacy and security is of utmost importance. Implementing strong data encryption and access control mechanisms is critical.
-Ethical Considerations.In situations where data fusion plays a role in critical decisions, such as in autonomous vehicles, ethical considerations concerning safety, liability, and decision-making become substantial. It is imperative to establish guidelines and regulations governing the utilization of data fusion in these applications.

Future Directions. The future of data fusion in ultrasonic sensor applications holds promise. As technology advances, we can anticipate the following developments:

- Advanced Algorithms. Ongoing research into data fusion algorithms, particularly those rooted in machine learning, will lead to more sophisticated techniques capable of extracting deeper insights from the amalgamated data. These algorithms will become more adept at recognizing intricate patterns and managing data from a diverse array of sensors.
- Sensor Fusion Integration. Ultrasonic sensors are frequently used alongside other sensor types like LiDAR, radar, or cameras. Future developments may concentrate on seamlessly integrating data from these diverse sensors to construct more comprehensive and dependable perception systems.
- Real-Time Processing. Efforts to enhance real-time data fusion continue, especially in applications where swift decision-making is critical, such as in autonomous vehicles. Real-time fusion algorithms and hardware will continue to evolve to meet the demands of these applications.
- Safety-Critical Applications. Within the domain of data fusion for ultrasonic sensors, there is perhaps no area more critical than safety-critical applications. Safety takes precedence in scenarios where lives and well-being are in jeopardy, and data fusion is instrumental in ensuring that safety remains uncompromised.
- Autonomous Vehicles. Autonomous vehicles represent one of the most prominent and demanding safety-critical applications of data fusion. The merging of data from multiple ultrasonic sensors, combined with other sensor types like LiDAR, radar, and cameras, is essential for providing a comprehensive view of the vehicle's surroundings. In this context, the focus on safety is twofold:

-Avoiding Collisions. Data fusion from ultrasonic sensors facilitates real-time obstacle detection and collision prevention. In rapidly changing traffic conditions, pedestrians, cyclists, and other

vehicles must be identified, and immediate actions must be taken to avert accidents. Safety is not a luxury but an absolute necessity.

- Redundancy and Fault Tolerance. Autonomous vehicles necessitate multiple layers of redundancy and fault tolerance to handle sensor failures or errors. Data fusion algorithms not only provide redundancy by integrating data from various sensors but also enable error detection and correction. If one sensor fails or provides incorrect data, fusion algorithms can compensate by relying on input from the other sensors.

- Healthcare. In the healthcare sector, the application of ultrasonic sensor data fusion for distance measurement holds profound implications, particularly in diagnostic equipment and medical imaging. In these safety-critical applications, precise distance measurements are indispensable for accurate diagnoses and treatment decisions. Data fusion enhances the reliability of these measurements, reducing the risk of misdiagnosis and ensuring patient well-being. Safety encompasses various aspects in healthcare data fusion:

- Ensuring Diagnostic Precision. In applications like ultrasound imaging, accurate distance measurements can have life-altering consequences. Errors in distance measurements can lead to misdiagnosis or incorrect treatment decisions. Data fusion enhances the accuracy of these measurements, thereby promoting patient safety.

- Preserving Privacy and Security. Healthcare data frequently contains sensitive patient information. Data fusion in healthcare applications must prioritize privacy and security. Robust encryption, access controls, and adherence to privacy regulations are imperative for protecting patient confidentiality and well-being.

- Industrial Automation. In industrial automation, where robots and automated systems collaborate with human workers, safety is paramount. These systems rely on accurate distance measurements to navigate and perform tasks in complex environments. Safety considerations in industrial automation data fusion encompass:

- Human-Robot Collaboration. As robots work alongside humans, ensuring safe interactions is crucial. Distance measurements from ultrasonic sensors are used to establish safe zones and to halt robotic operations if a human worker enters a predefined danger zone. Data fusion ensures that these measurements are accurate and reliable, preventing accidents and injuries.

- Machinery and Infrastructure Monitoring. Industrial automation often involves monitoring heavy machinery and critical infrastructure. Accurate distance measurements are vital for ensuring the safety of workers and the integrity of equipment. Data fusion enhances the reliability of these measurements, contributing to a safer work environment.

In these safety-critical applications, data fusion is not just a technological advancement but a necessity for safeguarding lives, ensuring the integrity of critical systems, and upholding the highest standards of safety and security.

- Ethical Considerations and Legal Frameworks. The deployment of data fusion in safety-critical applications necessitates thoughtful consideration of ethical and legal frameworks. These applications pose profound questions regarding liability, accountability, and the allocation of decision-making authority:

- Determining Liability and Responsibility. In the event of an accident or failure in a safety-critical system, attributing liability can be challenging. Was it a failure of the sensors, the data fusion algorithm, or the human operator? Legal frameworks must evolve to clarify responsibilities and liabilities in cases involving accidents related to data fusion technologies.

- Ethical Decision-Making. Safety-critical applications often require systems to make ethical decisions, such as prioritizing human safety above other considerations. Ethical guidelines for AI and data fusion are vital to ensure that these systems make decisions aligned with societal values and ethical principles.
- Regulatory Compliance. Legal frameworks and regulations governing safety-critical applications must keep pace with technological advancements. Governments and regulatory bodies play a crucial role in establishing and enforcing rules governing the development and deployment of data fusion technologies in safety-critical contexts.

Conclusion

The integration of data from ultrasonic sensors to measure distance represents a revolutionary technology that holds significant implications across a wide spectrum of applications. Through the amalgamation of information from multiple sensors, bolstered by cutting-edge algorithms and methods for handling uncertainty, distance measurements gain heightened precision, dependability, and adaptability to various environmental conditions. As technology advances, data fusion is set to assume an increasingly central role in addressing intricate real-world issues, ultimately shaping the trajectory of autonomous navigation, robotics, healthcare, environmental monitoring, and various other domains. To sum up, data fusion is a remarkable field that not only propels technological progress but also compels us to contemplate the ethical and safety consequences of our innovations. Moving forward, responsible development and implementation of data fusion technologies will be pivotal in unlocking their full potential.

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INCLUSIVE DEVELOPMENT OF NON-STATE PENSION INSURANCE AS AN ELEMENT OF INVESTMENT RESOURCES FOR THE RECOVERY OF THE NATIONAL ECONOMY OF UKRAINE

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ABSTRACT

The article examines the problems of inclusiveness of the private pension system in Ukraine. Economically developed countries demonstrate the effectiveness of pension accumulation systems. Pension funds are accumulated in accounts, are a significant source of investment in individual corporations and the national economy, and provide future pensioners with good income. Ukraine's national economic recovery plan will provide for the active development of the military-industrial complex, energy, housing and social infrastructure, industry, and other sectors of the national economy. Pension savings of Ukrainians may become one of the internal sources of investment resources for recovery. But this requires ensuring the inclusiveness of the development of the private pension insurance system, raising the level of financial literacy and investment awareness of Ukrainian society. All of this will become an important element of active investment development of the national economy of Ukraine, and first and foremost, its de-occupied and destroyed territories.
Keywords: restoration of the national economy, inclusion, private pension system, investment in reconstruction.

Aware of the need for rapid recovery of the economy and the social sector, the government is forming a Plan for the Reconstruction of the National Economy of Ukraine. During this period, the military-industrial complex, the energy sector, the construction of housing and social infrastructure facilities, and industry will develop quite actively. Other branches of the national economy the will be restored.

The war unleashed by russia in Ukraine leads to significant destruction in all sectors of the national economy. Reconstruction will require significant financial resources. The amount of damages from the destruction is increasing every day and, according to preliminary calculations, at least 1 trillion dollars will be needed to restore Ukraine after the war with russia [1].

In addition to external financing for the reconstruction of destroyed cities and villages, it is necessary to invest in the construction of industrial enterprises: the military-industrial complex, the engineering industry, and the extraction of natural resources. In the occupied and destroyed territories (according to the Ukrainian Wind Energy Association), more than 2/3 of wind generators in Ukraine stopped working [2]. It will also be necessary to reconstruct old oil and gas deposits, as well as to organize lithium and titanium mining enterprises. According to preliminary estimates, there are significant reserves of lithium in Ukraine, which are not inferior to the rich deposits of South America and Africa. In total, these are 4 objects - 2 deposits (Shevchenkivske, Polokhivske) and 2 sites (Dobra, Kruta balka). The demand for lithium, which is the main

component of lithium-ion batteries, has been increasing recently, according to the demand for electric vehicles, energy storage systems, etc., and the price of this metal has a rising trend [3, 4] .
Ukrainians will also be involved in investment processes, but for this they must master the basics of investment mathematics, financial technologies and financial literacy. Problems of financial literacy of Ukrainians existed even in pre-war times, so these issues are relevant.
In addition to foreign investments, mortgage lending is an important investment tool. Mortgage lending has a positive impact on the development of the economic sector, which receives investment resources and stimulates the return on investment. This toolkit makes it possible to modernize production, which helps to improve the quality and competitiveness of products and accelerates the country's economic development.
In the mortgage market, the mobilization of financial resources is a priority. This is because banks have the opportunity to transform the funds raised into borrowed capital and use them to finance the economy and the real estate market by providing mortgage loans.
The development of mortgage lending and the intensification of its positive impact on the restoration of the social sector of the national economy of Ukraine are possible through the development of the real estate market, ensuring its transparency, fair pricing and balancing the supply and demand for real estate.
It is necessary to pay attention to the issue of the introduction of information innovations in the financial market and the priority directions of ensuring investment processes in the post-war period of reconstruction of Ukraine. It is also necessary to take measures aimed at increasing financial literacy and investment activity of agents of the national economy, reducing the level of the shadow economy.
Why do we focus on the financial literacy of Ukrainians and the inclusiveness of financial services in this article? After the return of all territories, in addition to the reconstruction of the economy, attention should also be paid to social policy, in particular, to the growth of the population's well-being. After all, every country is interested in having an economically active population return and work for the benefit of the national economy. For this, an effective motivational mechanism should work in the country. The main element of such a mechanism is the financial component. We mean ensuring a decent level of the value of labor capital, as well as the formation of a model in Ukraine for the accumulation of financial resources of citizens through the system of non-state pension insurance. And such a system should be transparent, accessible to all Ukrainians and business entities (inclusive), and ensure high investment activity of pension savings during the reconstruction of the national economy [5].
Let us turn to the essence of inclusion in the context of the development of non-state pension provision. Inclusion is the process of increasing the degree of participation of all citizens in society. The need for increased participation is primarily felt by those with physical or mental impairments, mental disorders due to prolonged occupation or loss of property due to bombings. It envisages the development and application of such concrete solutions that will allow each person to participate equally in academic and social life. The concept of inclusion is close in meaning to the concept of "integration" and opposite to "segregation". In inclusion, all stakeholders must actively participate in order to achieve the desired result.
Inclusiveness is the inclusion of everyone in a certain system (for example, pension insurance), regardless of their physical, physiological or other characteristics. Inclusive values are, first of all, recognition of diversity, equality, justice, cooperation, participation [6].

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Inclusiveness is the inclusion of everyone in a particular system (for example, pension insurance), regardless of their physical, physiological or other characteristics. Inclusive values are, above all, the recognition of diversity, equality, justice, cooperation, and participation [9].

Inclusive development aims to ensure that all citizens of society benefit from sustainable economic and social development. Many organizations implement this approach in the fight against poverty by supporting education and providing livelihoods for those in need. It is the inclusive approach that will help Ukrainians become more active in making decisions about the need to invest in a decent life after they leave the workforce.

At the same time, inclusive values are not working in the field of private pensions.

There is a problem of insufficient control over the activities of non-state pension funds (hereinafter referred to as NPFs). There are negative trends in the financial performance of the funds, which is caused by non-transparent relations between NPFs and their counterparties.

The inefficiency of the non-state pension insurance system is confirmed by the unbalanced geographical distribution of NPFs and the low level of participation of Ukrainians in this system.

In the pre-war period, as of June 30, 2021, administrators of non-state pension funds concluded only 92.4 thousand pension contracts.

The structure of pension contracts as of 06/30/2021 was as follows

- with individual depositors - 85.5 thousand pcs;
- with individual entrepreneurs - 0.1 thousand;
- with legal entities - 6.8 thousand.

This situation is typical for economic relations in the financial services market. At the same time, the world experience shows that the role of the state in regulating the activities of non-state pension funds requires a stable legislative and legal framework, developed stock and insurance markets [7, p.50].

Non-state pension funds in developed countries play an extremely important role - they have taken over some of the functions of the state, in particular in relation to citizens who have reached retirement age. In order to ensure that non-state pension funds fulfill their obligations properly, a system of regulation and supervision is being created.

The International Social Security Association (ISSA), established in 1937, provides advice and a platform to its members (350 member organizations in 150 countries) to shape dynamic social security and its policies worldwide [8].

In 2004, the International Organization of Pension Supervisors (IOPS) was established to improve the quality and efficiency of supervisory activities for private pension funds around the world, thereby contributing to their development, increasing the efficiency of their operations and increasing the level of security of this source of income for pensioners [9].

The share of non-state pensions depends on the type of pension system operating in the country. There are three types of pension insurance systems (Table 1).

Table 1. Types of pension systems [10].

Type of pension system	Features	Countries in which the system operates
One-level system	Solidarity	Germany, Sweden, Switzerland, Czechoslovakia, Romania, Bolivia
	Cumulative	
Two-level system	State (solidarity) and non-state (accumulation) systems operate	France, Great Britain, Denmark, Netherlands, USA, Chile, Australia

	in parallel	
Three-level system	The first level is a mandatory solidarity pension system; the second level is a compulsory accumulative pension system; the third level is a voluntary accumulative pension system	Latvia, Hungary, Kazakhstan, Poland, Croatia, Ukraine

When studying the issue of pension insurance, it is worth paying attention to the problem of distribution of insurance contributions from the pension fund between employers and employees. According to some foreign experts, in order to maintain and increase the competitiveness of enterprises in the global market, it would be advisable to redistribute pension funding to all pension insurance payers equally. In particular, countries with developed market economies, by introducing a funded pension system and mandatory and voluntary pension insurance, have relieved enterprises of some of the burden of financially providing pension payments to the population. This funding was transferred to the working population [11].

Ukraine is currently unable to make a radical transition to a mandatory funded system. This requires: the overall development of the national economy, growth of incomes, the formation of an effective system of non-state pension funds, a developed legislative framework and the preparation of society as a whole for the practical implementation of such reforms.

Ukraine faces the task of transitioning to models of long-term investment accumulation as an effective means of economic growth. This path lies through the active use of the last two levels of funded pension provision - compulsory state and voluntary private pension provision. The main institutions that are called upon to provide the latter are non-state pension funds.

The study of the world experience of the functioning of non-state pension funds and the regulatory and legal support of the activity of the NPF in Ukraine allowed us to come to the conclusion that these are quite reliable and promising players of the financial services market, and their effective development will allow to accelerate the pension reform in Ukraine and thereby activate investment processes and increase welfare pensioners

The gradual winding down of the economically inefficient solidarity system of pension insurance and the introduction of mandatory cumulative insurance will lead to positive socio-economic results. In particular: it will provide a decent pension, establish a real dependence of the size of pensions on the amount of earnings and work experience, strengthen the stimulating function of wage legalization, become an important component of creating a powerful source of investment resources for the growth of the national economy.

Despite the rather optimistic forecasts of analysts, who estimated that half of the pension savings, aimed at investing in the national economy, will contribute to GDP growth in the long term. As of June 30, 2021, the main areas of investment of pension assets were government securities (47.2%), deposits in banks (35.6% of invested assets), bonds of enterprises whose issuers are residents of Ukraine (8.1%), total real estate objects (3.1%), domestic local loan bonds (2.5%) This is due to a number of reasons, the main of which is the low level of income and distrust of ordinary citizens in financial intermediation [12].

Inclusive development aims to ensure that all citizens of a society benefit from sustainable economic and social development. Many organizations implement this approach in the fight against poverty by supporting education and providing livelihoods for those in need. It is the

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inclusive approach that will help Ukrainians become more active in making decisions about the need to invest in a decent life after they leave the workforce.

Given that inclusive development is aimed at ensuring that all members of society benefit from sustainable economic and social development, addressing the issue of pension insurance inclusion in Ukraine will help to overcome poverty among socially vulnerable and economically inactive members of society, inequality, social exclusion, etc. The inclusion of non-state pension insurance will help Ukrainians become more active in making decisions about the need to invest in a decent life after retirement.

At the same time, inclusive values in the field of private pension provision are not working in Ukraine. The goals declared when the third pillar of the pension system was introduced have not been achieved.

A study of the global experience of non-state pension funds and the regulatory framework for NPFs in Ukraine has led to the conclusion that they are quite reliable and promising players in the financial services market, and their effective development will accelerate pension reform in Ukraine, thereby boosting investment processes and improving the welfare of pensioners. In order to solve the problems, it is necessary to turn to positive international experience and create an effective system of regulation and supervision of NPFs.

Co-financing of pension contributions by the employee and the employer at the initiative of the employee could be an effective factor in motivating individuals in a ratio that should be calculated actuarially taking into account the following initial conditions:

– the state loses a part of the income tax as a result of including the sums contributed to the NPF as part of gross expenses.

– the employer loses a part of the profit, therefore appropriate compensating mechanisms must be provided;

- the employee voluntarily partially gives up consumption in favor of saving for old age.

A possible option would be to provide a citizen (spouse) with a legally established right to educate their children at the expense of the budget (provided that the amount of pension savings is available to pay for it on a commercial basis).

The lack of awareness of the principles of functioning and the low level of trust in the NPF institution can be overcome mainly through appropriate explanatory and educational work and, as we have already noted, by raising the level of financial literacy of the population.

Therefore, the government should consider launching appropriate public awareness programs to cover all aspects of the pension reform, including private pensions, as widely as possible. It is advisable to create programs to teach the basics of investment mathematics and financial literacy.

Finally, the presence of significant savings in the private pension system may be the basis for an earlier retirement from the mandatory funded system (if it is introduced) and even from the PAYG system. In our opinion, the retirement age in all three components of the pension system should be interconnected in some way, i.e., represent a comprehensive incentive system.

All of these measures will help to ensure the inclusiveness of the private pension insurance system, increase the level of financial literacy and investment awareness of Ukrainian society. All of this will become an important element of active investment development of the national economy of Ukraine, and first of all, its de-occupied and destroyed territories.

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AGHAMUSA AKHUNDOV'S PROFESSİONAL AND DEEP SCİENTİFİC JUDGMENTS ABOUT THE LANGUAGE CONCERNS OF POETRY

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ABSTRACT

The main aim of the article is to explore Aghamusa Akhundovs professional and deep scientific judgments about the language concerns of poetry.

In the scientific heritage of Agamusa Akhundov, the actual problems of the language of poetry occupy an important place. The unity of content and form in poetry and the unique role of artistic language in this matter have been interpreted in his works from different aspects. In his writings about the beauty of the language of poetry and its most important features, Agamusa Akhundov put forward new considerations, generalized considerations about the linguistic organization of poetry, and the means of creating aesthetic appeal. He approached the artistic composition of the text from the point of view of linguistics, and managed to systematize his theses about the poetic properties of language units with precise comments. The scientific-theoretical explanations of the researcher, who effectively deals with the linguistic and stylistic problems of poetry, demonstrate that he has linguopoetics, poetic taste, intuition and a sense of beautiful poetry.

Application importance: the material can be used in lecturers and seminars in higher education institutions.

Keywords: actual problems, aesthetic appeal, language of poetry, stylistic problems, poetry, linguistic organization, text, style

Introduction

Agamusa Akhundov's opinions about the means of determining the overall harmony of the poetic text and the components of the artistic language structure have been explained in numerous research works. The scientific value of these works is further increased by the accuracy and importance of the theoretical analysis given to the poetic issues arising from these linguistic facts with rich materials. When speaking about the laws of poetic language and style of poetry, Agamusa Akhundov skillfully used the scientific heritage of famous theoreticians in this field, as a result of his selfless work, he wrote a monumental book and numerous scientific articles explaining this problem. His books "Issues of Language and Style" (1970), "Art of Poetry and Language" (1980), "Esthetics of Language" (1985), "The Poet and the Word" (1959), "Poetry of Voice" (1978), "Voices" language opens" (1976), "The Poet's Wisdom" (1986) and others. his articles approached the beauty of the poem that emerges from the language, sound and rhythm structure from the lingupoetic aspect, and succeeded in explaining the scientific-theoretical theses he put forward in terms of the aesthetics of the genre.

The main part. Serious interest in actual theoretical-methodological problems of Azerbaijani poetry directed Agamus Akhundov to the goal of keeping alive the scientific concept of poetry poetics. The tendency to generalize the advanced experience gained in Azerbaijani poetry and the achievements of the artistic-aesthetic movement is clearly felt in the original pen products dedicated to this field. The rich materials of Azerbaijani poetry also gave the author ample

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opportunities to analyze the language of poetry and the achievements of powerful wordsmiths within a wide aesthetic system, to determine its main evolutionary trends, and to comprehensively illuminate the theoretical foundations of poetry style. This factor, in turn, opened the way to the possibilities of interpreting the conclusions about the aesthetic essence and stylistic regularities of the language of poetry on a large scale, and prepared a real basis for making opinions and considerations about the form culture of the poem. It stimulated the work of processing language and style problems in the context of the literary process against the background of the achievements of literary studies in general.

Agamusa Akhundov's works show that the rise of literature, the relevance of language and style problems was born from the aesthetic necessity of the time, and achieving its objective interpretation by fulfilling these problems at the modern scientific and theoretical level resulted from the increase in aesthetic demand for the word. The growth of the problem of style, the expansion of its poetic dimensions has become the basis for the development prospects of poetry, and by studying it from an artistic-linguistic point of view, Aghamusa Akhundov has gained the opportunity to visualize the semantic-psychological depth of our native language, to reveal and demonstrate the artistic-cognitive strength of the language of poetry.

Aghamusa Akhundov prefers to evaluate the linguistic and stylistic features of lyrical works distinguished by their emotional richness and intellectuality in terms of true artistic dimensions. By analyzing the poetics of the poetic examples that embody the concerns of the time and the artist's personality, which are the manifestation of the artistic ability of the poets, he highlighted the problems of artistic language and its evocative role. Each work of this genius linguist-scientist suggests the importance of the poetic language problem in the progress of the literary and artistic process, and was seen as a manifestation of care and demand for the language of poetry. When talking about the aesthetics of the artistic word and the current problems of our spiritual culture, Agamusa Akhundov managed to reveal the merits and demerits in the language of the poetic examples he analyzed with all their prominence and linguistic intricacies. That is why an important part of his most serious works are particularly striking examples of linguistic poetics. These scientific examples appeared at that time, when literary studies and literary criticism also showed special activity for the sake of the style of poetry. At such a moment, Agamusa Akhundov's influential intervention in the process of artistic creation as a theorist of artistic language gave a special impetus to increasing attention to the issues of craftsmanship in linguistics. Focusing on solving a number of important problems of the language of poetry, Agamusa Akhundov studied the linguistic material, rhyme, structural problems, rhythm and intonation, weight, etc. of the language of poetry. intensified his writings related to issues related to quantity and quality. In all cases, he acted from the correct artistic position and the principle of craftsmanship.

Aghamusa Akhundov, who closes the evolution of artistic speech with the choice of words, this choice, talks about the necessity of putting the language of poetry into the patterns typical for folk speech, the degree of adaptation of the style of expression to the schemes of the living language of communication, and specifically notes that the artificial style of expression cannot acquire the ability to evoke a new image. Poem lines move the reader's thoughts when they can be charged with the energy of poetic judgment. By revealing the existing aesthetic types of this necessity, the author concretizes the echoing storm images in the artistic prostration, refines the language elements that show themselves more prominently in the poetics of the poem with special sensitivity.

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For Agamusa Akhundov, artistic word creation is taken and analyzed in a broad aspect. His conclusion is that "the artistic language, which is one of the specific styles of the literary language based on the universal language, can be explained as a creative product in the broad sense of the word due to its processing characteristics, influence and degree. (1, 15) The individuality of the style of each poet is born from this creative uniqueness. The manner in which all linguistic materials, starting with the smallest language unit phonemes, are processed in the language of poetry plays an important role in shaping the individuality of each poet.

Academician Isa Habibibeyli, who called his articles dedicated to Agamusa Akhundov's work "the founder of Azerbaijani linguistic poetics", believes that the concept of aesthetics of language was brought to Azerbaijani linguistics by Agamusa Akhundov (3,7).

Indeed, the artistic style, as well as the theoretical thoughts about the language of Azerbaijani poetry, allow us to say that he is a unique writer who explores the inner energy and potential possibilities of the linguistic materials, which are the expression of the poetic voice, with an original writing style. "Despite the fact that it was written in different years, the style of wordsmiths who differed from each other according to the set line, the aesthetic possibilities of separate linguistic categories, despite the fact that the author created a whole system at a high scientific-theoretical level, in the light of the development of the science of linguistics, the very important components of artistic creativity and summarized a number of issues related to linguistic poetics." (4, 47) in his numerous works on the language and poetics of poetry, A. Akhundov made professional and deep scientific judgments about the language concerns of poetry, and expressed a serious scientific attitude to the modern poetic experience of our ancient and rich poetry. What is noteworthy is that A. Akhundov, standing in the position of active artistry and high aesthetic level in all cases, gave a professional analysis of the language habits of young writers, investigated the artistic heritage of outstanding art luminaries from a linguistic point of view and at the level of large art dimensions.

Agamusa Akhundov's thoughts on the artistic language of poetry poetics refer to solid scientific evidence. As defined by the researchers of the language of poetry, "a series of works by the outstanding scholar Agamusa Akhundov are notable examples for characterizing the main attributes of linguistic poetics. We should also take into account the connection of his scientific creative achievements in this field with the development experience of the poetic style and the achievements of artistic language culture. (5, 61) Because the general-theoretical problems of the language of poetry have found their scientific interpretation in his works in a broad philological background. Aghamus Akhundov talks about the poetic beauty created by phonological devices in poetry in his writings about the phonetic organization of the poem, and pays special attention to the harmony, fluency of rhythm and soundness of the poem. A. Akhundov interpreted his ideas on alliteration and assonance, regularities of arrangement of sounds, subtleties of accent and intonation, reasons for formation of phonetic phenomena in the context of poetry, rhythmic units and rhyme structure, etc., based on specific examples of Azerbaijani poetry.

As Gazanfar Kazimov wrote, "prominent representatives of the 60s generation, especially Agamusa Akhundov, as a philologist, were consistently interested not only in linguistic issues, but also directly in literature, literary studies and literary criticism, and had a consistent opinion about both the classics of our literary history and the creators of our literature today. said. (6, 57) A. Akhundov preferred to interpret the ideas of the writing style of his contemporaries with the language of representatives of classical poetry by contrasting their writing samples. We compared M. Mushfiq's poem "Oxu tar" with Isgender Coshgu's poem written in the same volume, both of

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which are composed of three-syllable stanzas. While the lines in the poem "Oxu tar" have the same boundaries of words and syllables, in I. Coshgun's poem, the rhymes deviate from the normal scheme, the unity of rhymes is broken, and the rhythm is disturbed. Proceeding from this factor, A. Akhundov points out such an irrefutable idea that the overlap of the number of syllables in the verses is still not enough for the creation of poetry. The real problem is taking strict rules of rhythm and intonation in following the traditional golden rules of poetry.

A. Akhundov also notes the poetic role played by S. Vurgun and H. Arif in the technique of poetry that non-accented words - enclitics - have a stylistic merit at the end of the verse. Determining the discovery of enclitics as an artistic tool by S. Vurgun in Azerbaijani poetry (2, 9), the author shows that verses ending with enclitics have a pleasant tone, and the reason for this is that the descending intonation fades away in the unstressed last syllable. S. Asad and A. Maharramov justify this idea on the basis of the verses ending with the personal pronoun "o" that this pronoun can have a stylistic-artistic rhyme at the end of the poem line only by using it without emphasis.

Approval of research results. While talking about the unique role of alliteration and assonances, stylistic-phonetic means in the language of poetry, the creation of sound images, Aghamusa Akhundov always focuses on the connection of the poetic design in poetry with the sound structure of the language. It illuminates the main typological features of phonetic-stylistic categories based on the literary and artistic experience of the most prominent wordsmiths. For example, a number of lingupoetic aspects of Mikayil Mushfig's and Samad Vurgu's lingupoetics were interpreted on the basis of the sound structure of their poetic language, and the stylistic possibilities of spoken voices were analyzed on the basis of the internal phonetic features of the poetic language of both giants. Poetic language materials of S. Vurgun and M. Mushfiq have written with high professionalism the poetic regularities of the language at the phonetic level. As you can see, the title of the articles "The Language and Art of Poetry of Samad Vurgun" and "About the Language and Art of Poetry of Mikayil Mushfig" coincide in terms of structure and meaning. Samad Vurgun's article "Seslar dil achir" (Baku newspaper, July, 1978) dedicated to the phonopoetics of Vurgun language, and the article talking about the specifics of the development of phonetic units in the poetic indicators of Mikayil Mushfig's works, are carriers of the same scientific and aesthetic impressions. In both works, the dynamism of speech sounds in the structure of the verse, the use of the same and close denominator sounds in the style of expression, are taken as research subjects.

"Sounds open the language" summarizes the repetition of same-sex sounds as a stylistic-phonetic tool with high artistic power. Samad Vugu's poetic language materials, its harmony and musicality, all its subtleties confirm the conclusion that "the sounds of speech open the language like the words of a poem" (1, 147). This idiom tradition from our El literature and classical poetry is continued by phonetically accompanying the greatness of the thought expressed in the verses. The repetition of the same denominator sounds, the internal sound qualities of the words involved in the poetic composition of the verses, and their features of creating music in the general harmony of the poem are summarized in a fundamental way.

Agamusa Akhundov, who was not limited to these notes about sounds of artistic creativity, was seriously engaged in the phonopoetics of other great masters of the word and achieved successful scientific results in this field. Kamil Valiyev rightly pointed out in his opinion about the book "Esthetics of Language" published in 1985 that "The same thing can be said about the article "About Mikayil Mushfig's language and art of poetry". In this article, Mushfiq poetry is

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interpreted as a means of creating harmony and music. Sound image, harmony law are studied as factors expressing artistic beauty and fluidity. The analysis of the famous artist's works from the perspective of poetry is also interesting." (7, 187) Here, the unique stylistic-phonetic features of our mother tongue are revealed, and the inexhaustibility of the poetic possibilities of spoken voices is confirmed in the example of M. Mushfig's pen products. Based on strict scientific and theoretical principles, A. Akhundov once again clarifies in detail that the beauty of M. Mushfig's lyrical works in terms of content and form, poetry technique, language and style lies in the ability to make maximum use of the opportunities required for language beauty. The "Poetry of Voice" part of the article sheds light on the artistic methods used by the poet, specifically the poetic organization of voices. The forms of manifestation of the great traditions of alliteration and assonance in the poems of M. Mushfiq, the possibilities of voice imitation to create a sound image of the described-sung things and events, their artistic-aesthetic qualities were determined, and the serious stylistic meaning manifested by the repetition of consonants and vowels, which increases the alliterative power of internal sound associations, was revealed. . In Mushfigin's language, the same consonant often goes beyond the limitations of verses and verses and belongs to the entire literary text in the example of A. Akhundov's poem "When it is raining", specifically, the smell of rain is brought to the poem as a result of the repetition of the consonant "y" 42 times and the consonant "ğ" 22 times, "y" . sees in unity with expression patterns. Or, in the following lines of the poet's famous poem "Telegraph Wires", the poetic unity formed by the repetition of the vowel "e" illuminated the linguopoetic regularities. In the stylistic operation of overlap between the poetry of the word and the poetry of the voice, he takes the poet's poem "Winds" as an example while commenting on the correct choice of rhyming words. A. Akhundov appreciated that the vowel "u" in the verses formed by syntactical parallelism and word repetition is reminiscent of the roaring, roaring sound of the wind as an example of approaching sounds with the criteria of artistic creativity.

A. Akhundov, like A. Demirchizade, considers the fact that verses in Mushfiq verses consist only of words with thin vowels as one of the poetic secrets of the Azerbaijani language, and does not overlook the feature of bringing beautiful harmony and fluidity to the artistic text. In the work of giving unusual poetic power to ordinary speaking sounds, he brings to the fore the sound sense and poetic idiom talent of the word artist.

In the article "The Poet and the Word", the artistic excellence and high artistic features of the word are interpreted as an important means of embodiment of the idea-content, and the exemplary language indicators of the poem are brought into consideration as a decisive factor underlying literary-artistic principles and tools. "Sufferings and sufferings for words (2, 22) are considered a stimulus for the harmony of the language structure, which can be transformed into an aesthetic phenomenon.

A. Akhundov shows that the combination of "beautiful woman" in the verse "Berlin's first beautiful woman" (S. Vurgun) is not in accordance with the rules of the Azerbaijani language, and it is more correct if it is used in the form of "beautiful woman". managed to sound beautiful. So, with the power of S. Vurgun's pen, the grammatical meaning of those words could not withstand their stylistic meaning. (2, 23) according to the author's conclusions, the word, which is the main tool of artistic creativity, demonstrates its inner semantics and stylistic appeal when used on the spot.

Aghamusa Akhundov uses the term "judgment-time" used in M. Rahim's poem "Leningrad Skies", the "lamb" used by R. Rza as an example from the poem "Lenin", "condemn" found a

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place in S. Vurgu's famous poem "Azerbaijan", S. The expressive potential of the words "khay" selected for their functionality in Rustam's poems is listed as suitable for artistic-aesthetic inventions, the possibilities of manifestation with new stylistic shades, and finally, the dependence of all these on the level of talent of the wordsmiths, the efficiency of work on words, and their aesthetic worldview. He once again draws attention to the idea that poetic perfection is actually created due to the work done on artistic form and words. Obsessed with the stylistic color of this or that word, and the distortions of ideas caused by lack of ethnicity in its lexical meaning are "Hayan" in Suleyman Rustam's poem "Amu Darya", "asiman" in M. Rahim's poem "Leningrad Goeysde", and "stranger" in Zeynul Khalil's poem "love". ” is highlighted. The flawed aspects of inaccuracy in the choice of words are conveyed to the reader through the poetic examples shown.

Agamusa Akhundov compares the words of the poet to the colors of the artist, and considers the power of the poet to be the main factor for reviving the paintings of living life in the guise of words: "In order to create a living painting, the artist is completely free from words belonging to this or that language, forgotten words, as well as words that have passed into our language from other languages and can use freely. There is nothing unusual here. Let a single plate be complete and lively, effective and beautiful" (2, 27) The certainty and appropriateness of the numerous idioms and dialect lexicons used in the lyrical works of Osman Sarivalli in the artistic plates created gives A. Akhundov the right to make such a judgment that with the lexical and ethnographic means in the language of dialecticism of poetry, the language of poetry is built on the basis of the communication language of the people as a whole, poets gain opportunities to penetrate deeper layers of the language, efforts to bring the transparency of the people's breath to the language of poetry, and the atmosphere of the spoken language are strengthened. In the expression of the poetic attitude to the ethnography and everyday life of the people, Shiv words are as important as the natural patterns of the poetic image.

"One cannot expect a beautiful artistic work from a poet who lacks the ability to choose characteristic words. Because the poems lacking this quality will be ordinary pieces of poetry, far from artistic. Such pieces of poetry are called rhetorical writings. According to A. Akhundov, who came up with the proposition (2, 29), the use of synonyms, persistence in finding the right word is an important factor in the artistic value of a poetic work. Comparing synonyms to "nails that bind the meaning to the verse", the author clarified his views on this issue with the stylistic features of closely related words such as "desire, action, murad, wish", "scarcity, poverty", "tantana, busat, tamtarak", which he took from the following example, and their text suitability to its environment, the variety of stylistic features in synonymous words, their poetic potential, conformity to the core of the poetic idea, etc. involved in the analysis.A. Akhundov specially notes that thanks to the accuracy of synonyms, their stylistic-poetic capacity is immediately felt. Synonymous stylistic activity at all levels is reflected in the character of lyrical detail, the environment of development directs it to a certain stylistic course. In the pen of perfect wordsmiths like O. Sarivalli, synonymous words acquire new nuances of meaning, regardless of the degree of closeness and similarity in meaning, each word can be presented with its own stylistic nuances.

Conclusion

Summing up our thoughts on A. Akhundov's thoughts on poetic language, we would like to note that the scientific thoughts we have listed reflect his rich theoretical thinking and experience. His researches related to the language of poetry bring to the fore the most urgent problems and

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important tasks of ancient and rich Azerbaijani poetry, and draw special attention to language and style concerns against the background of the success of our poetry.

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STUDYING THE MECHANISM OF CREATING WORK AT THE LESSON BY THE METHOD OF INTEGRATED APPROACH

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ABSTRACT

The main aim of the article is to explore the study of mechanisms of creating work in the lesson by the interactive method. The article explains the essence of the concept of work, which is one of the important quantities in physics, and analyzes the mechanism of the phenomenon of its various forms. Here they distinguish between ordered and irregular forms of work, explain the imbalance within the system as a result of the action of external forces, and the relationship between the processes within the system and the work performed against this background.
Importance of the application: material can be used in organizing interactive classes in lecturers and seminars in Higher Education Institutions.
Keywords: regular work, irregular work, dissipative process, system, substituting force.

Introduction

The article explains the essence of the concept of work, which is one of the most important quantities in physics, and analyzes the mechanism of manifestation of its various forms. Here they distinguish between ordered and irregular forms of work, explain the imbalance within the system as a result of the action of external forces, and the relationship between processes within the system.

The main part

The concept of work first appeared in mechanics as a scientific category. It is calculated as the scalar product of the compensating force applied to the system and the displacement vector created by this force.

$$\delta A = F \cdot dS \qquad (1)$$

F – is displacement force, S - is the directional vector of the point of application of the displacement force. This shows that work in mechanics is studied as a quantitative measure of the influence of one body on another body. After its first creation and study, this concept passed into other sections of physics and, depending on the nature of the acting force, was designated as thermodynamic, electrical, magnetic, gravitational, chemical, etc.

Taking a more general approach to work, one can see that work is expressed as a quantitative measure of the process of resisting some force. The key factor when studying work as a physical quantity is whether the compensating force is zero.

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Taking work as a quantitative measure of the influence of one system on another, it is necessary to distinguish regular work from irregular work. Regular work is a type of work on mechanics and thermodynamics. This type of work is associated with the displacement of the system to which the force is applied in a certain direction. As a result of the chaotic arrangement of systems to which forces are applied, the work done against forces whose replacement is zero is called disordered work. Uneven operation is not due to the system being misaligned in a particular direction. For example, if a fluid is completely compressed, work is done, but no displacement occurs [5].

A characteristic feature of useful work in an ordered form of work is that the substitute for repulsive forces is nonzero. This gives direction to the process. This is how mechanical systems work. The operating principle of mechanical systems is based on the transformation of a purposeful form of movement into another form of movement. Not only mechanical and technical devices, but also chemical, biological, environmental, etc. systems do the same [6].

From the point of view of mechanics, the work of any force is a measure of the influence of one body on another. It characterizes the work process and depends not only on the initial and final states of the system, but also on the trajectory of the process. Therefore, to denote elementary work depending on the process path, it is appropriate to use the sign δ, which does not have a full differential meaning.

If we denote the displacement vectors of elementary objects to which a force is applied by Si, and the forces acting on them by Fi, then the impact on the system can be calculated as the sum of the elementary work performed on each element:

$$\delta A_i = \sum_k F_i \cdot dS_i \neq 0 \qquad (2)$$

This expression represents the final work done by an i-type force on all elementary objects. It is clear that the result of this influence will be different depending on the direction of the elementary forces and the displacements they cause.

Regular work performed on a system consisting of interacting bodies upsets the balance in the system. Changes of the opposite nature occur in different parts of the system: one part of the system is charged positively, the other negatively; temperature and pressure in one part increase, and in the other, on the contrary, decrease. In other words, there is a potential difference. This process usually causes the movement of air masses and the occurrence of an electric current in the wire. Different parts of the system move in opposite directions.

Such an internal displacement in the system leads to a redistribution of particles and a shift in their center of distribution. This process is regular.

Electric charge, impulse, matter, etc. are parts of a homogeneous system. As a result of redistribution, normal work can also be carried out when the center of property distribution changes. For example, the work done when cars move from one side to the other inside a ship sailing at a constant speed and loaded with cars is ordinary work [4].

Regular work is also performed when the forces Fi produce movements Si of different signs. This work occurs due to the polarization of magnets, ionization of gases and shaft tension.

We can review at the mechanism of action of electric polarization. Although electrically neutral, some materials are polar, meaning they are made up of positively and negatively charged atoms. For example, the fact that the hydrogen atoms in water are positively charged, and the oxygen

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atoms are negatively charged indicates that water is a polar substance. If a polar material is placed in a non-uniform electric field, that is, in a space where electric charges are distributed with uneven density, work can be done on the material [1].

A diatomic polar molecule placed in an electric field of intensity E forms a certain angle with the direction of the electric field. The force acting on charge q in an electric field is calculated by the formula:

$$F = qE \qquad (3)$$

Therefore, the force acting on a positive charge with coordinate S+ will be equal to qE, and the force acting on a negative charge with coordinate S- will be equal to -qE.

The molecule rotates under the influence of these forces acting on the ends of the polar molecule (Since the displacement force acting on the molecule is zero, its center of mass does not change. If, under the influence of the field, the atoms move dS+ and dS_, then the work is accordingly:

$$\delta A = (qE \cdot dS_+) - (qE \cdot dS_-) = qE \cdot d(S_+ - S_-) \qquad (4)$$

This expression indicates the work done on one molecule.

Irregular operation produces the same change in physical quantities in different parts of the system, does not disturb the equilibrium within the system and the location of the distribution center, that is, $dS_i = 0$. Temperature, pressure, density, mass, speed, etc. increase or decrease equally throughout the system. For example, irregular operation may include complex compression and expansion of gas.

Dissipative forces are also zero-replacement forces. Although the replacement of forces of this kind is zero, each elementary act of dissipative work has an ordered character. The work in each elementary act is found according to the product $F_i \cdot dS_i$ and is not equal to zero.

This work for the entire system is calculated as follows:

$$\delta A_i = \sum_n F_i \cdot dS \neq 0 \qquad (5)$$

Dissipative work occupies an intermediate position between regular and disorderly work. This work is performed by forces with non-zero counterweights, against the “dispersion” of forces with zero counterweights as a result of the chaos of their directions.

Dissipative work is part of regular work that becomes disordered. Such work is performed during such phenomena as heat transfer, phase transitions, crushing of materials, heating of the system occurring in the processes of metal cutting, and destruction of matter. [6].

Work is done as a result of the expansion of gas or steam. As a result of heating, complete expansion of a gas of a certain mass occurs. The center of mass of the gas remains stationary at this time. If friction losses are not taken into account, then the ambient pressure on the gas coating is the same as the gas pressure on the coating from the inside. When the gas is heated, its coating changes its position under the influence of environmental pressure. At this time, the surface of the gas shell *dS* changes its position to *dz*, and the gas does work on the environment by *PdSdz.*

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$$\delta A = \int P dS\, dz \qquad (6)$$

Since the pressure over the entire surface of the coating is constant according to Pascal's law:

$$dV = \int dS\, dz \qquad (7)$$

when the volume changes, the work is equal to:

$$\delta A = P \int dS\, dz = PdV \qquad (8)$$

Since the pressure is the same at all points of this system, the system has internal equilibrium. The system in which the gas is located expands under equal pressure on all sides, the pressure gradient becomes zero. Here, the compensating pressure force is equal to:

$$\boldsymbol{F}_t = \int \boldsymbol{P} \cdot dS = 0 \qquad (9)$$

This causes the pressure force to be zero because the pressure gradient is zero.

Conclusion

Thus, during expansion, the gas works against external forces. Although the forces acting on the gas are individually non-zero, their substitute is zero.

The work done in inhomogeneous systems can be characterized as work against the work of non-zero and zero forces. In other words, this work can be either regular or irregular. It can be either external, when the system interacts with the environment, or internal, when parts of the system interact with each other. This work can be rewarding and wasteful [5].

A parallel comparison of ordered and disordered products shows that they represent two different aspects of the same form of energy. When working in an orderly manner, one form of energy is converted into another form of energy. With irregular work, energy does not change its form. Regular work is a quantitative measure of energy conversion, and random work is a quantitative measure of energy transfer [1].

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AZERBAIJAN LIBRARIES AT THE LEVEL OF MODERN STANDARDS (ON THE BASE OF REPUBLIC YOUTH LIBRARY NAMED AFTER J. JABBARLI)

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ABSTRACT

The main purpose of the article is to research Azerbaijan libraries at the level of modern standards on the base of Republic Youth Library named after J. Jabbarli. Today, the vast majority of people in the world widely use computers for various purposes. Especially for the younger generation, computer use has become a normal way of life for their activities.
The integration of computers into the field of education and culture also reflects these trends. The successful application of computers in the field of education and culture depends not only on their availability, but also on how familiar the users are with them.
The article covers technical and software and electronic service problems applied to modern library-information service.
The application importance: the material can be used in the lectures and seminars in Higher Educaion Institutions. One who is interested in librarianship also can benefit form this research.
Keywords: modern libraries, library standard, library service, information space.

Introduction

The development of ICT in the modern era is one of the important indicators of the intellectual and scientific potential of each country, and the necessity of this process is more felt in the current era of globalization. The rapid development and spread of these technologies creates wide opportunities for the development of mankind.
Libraries have a great role in meeting the information needs of the society. Modern libraries regularly enrich their electronic document fund, electronic resources, create databases, and can deliver any electronic material to readers around the clock.
Thus, today, the library is turning into a virtual electronic information center as a result of the full computerization of all library processes, along with its traditional functions of acquiring books, storing them, protecting them and making them available for temporary use to readers. As it can be seen, the application of technologies to information communication leads to a change in the structure of the main function of libraries, turning them into a multi-functional institution.

The main part

This multifaceted field of activity is increasing the importance of libraries in society. That is why it is extremely important to apply modern information technologies to libraries. In our opinion, it is very important to apply modern information technologies and create electronic databases in libraries with a rich background.
Preservation of our cultural and historical heritage is the way of development of libraries. In addition to the development of this field, efforts are being made to ensure that libraries enter the world information space. The electronic catalog and electronic library of the country's large

libraries should be raised to the level of modern standards, and on its basis, the virtual library of Azerbaijani literature should be made fully available to readers.

The President of the Republic of Azerbaijan, Ilham Aliyev, signed the decree "On improving the activities of libraries in Azerbaijan" [4] dated April 20, 2007, regarding the improvement of librarianship in the country, their technology and software that meet modern requirements. So, according to the decree, libraries should be modernized and provided with modern information technologies.

According to the relevant decree of President Ilham Aliyev, libraries in the country were provided with modern technical equipment, the automation process of libraries was strengthened, and new technologies were introduced and used in libraries. In general, it is difficult to imagine modern library work without new information and communication technologies.

There may be a library that does not have a website. Libraries without a website can create a blog for themselves and share their information with readers. Libraries can open a page for themselves on the above-mentioned networks, namely Facebook and Twitter. And they should have tried to make the website and pages they created have a colorful design. On these pages, information is provided about the events that will be held in the library, photos and videos of the events are posted, readers are introduced to the innovations in the field of the library, and regular information is posted about new books that have entered the library.

On October 6, 2008, Mr. President Ilham Aliyev signed a decree on the approval of the "State Program for the Development of the Library and Information Field in the Republic of Azerbaijan in 2008-2013" [3]. The Youth Library has carried out a number of works in the field of library and information. Taking into account the profile of the library in order to meet the demands of our modern readers in this area, it has given special importance to the collection process of the fund. Thus, the library fund has been constantly enriched with classical and modern Azerbaijani and world literature.

In order to develop Azerbaijani studies, a catalog and card file related to country studies and regional studies has been created in our institution. In this card file, which readers refer to the most, they are "National leader Heydar Aliyev", "Decrees of the President of the Republic of Azerbaijan", "Laws of the Republic of Azerbaijan", "Constitution", "Tourism in Azerbaijan". and other topics, there are sections in Azerbaijani and Russian languages.

In order to classify books at the level of modern standards, based on our discussions with the Moscow EBNIT Association, the latest electronic version of CBT was applied in our library. And today, all literature is classified according to that CBT. A free WI-FI system has been installed in the library since the beginning of 2013 in order to ensure the use of the electronic catalog by the readers.

Users have the opportunity to access the websites of the world's largest libraries and use their databases through the link "Libraries of the world on the Internet". The site has direct links to the German Bundestag Library, the Russian State Library, the French National Library, the United States Library of Congress and other library sites.

The youth library, which plays the role of a methodical center for the regional MKS, has organized a series of trainings for the employees of these libraries on the website and their response to modern requirements almost every year. "Development and modernization of library websites" (December 10-13, 2013), "Creation of electronic catalogs of periodicals" (December 03-07, 2013), "Using and making changes to the electronic catalog" (November 26-30, 2013) are such trainings.

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The youth library used the IRBIS-AKIS system to present its resources to the readers and thereby provided readers with access to the electronic catalog, electronic library and other bibliographic databases through the Internet. An electronic catalog and an electronic library were created. New databases named "National leader", "Oil strategy", "Ecology" and "Sport" have been placed in the electronic catalog.

In the youth library, training was held on the subject of "Informatization of libraries. Electronic library", where the qualification level of city and district library employees who are users of the IRBIS-64 Automated Library Information System was increased. The main functions of WEB-IRBIS, installation of the Apache program, electronic catalog and electronic resources to the Internet international network extraction, creation of bibliographic bases and other issues were taught.

In addition, "Requirements of the information society and libraries", "Electronic resources of libraries: Problems and Prospects", "Experience of the Republican Youth Library in the field of informatization of libraries", "Administrator and reader modules of IRBIS-64 AKIS" in the topic "Management of electronic resources of libraries" work with, "Additions and changes in Electronic catalog and Electronic libraries" etc. Trainings were held on such topics. The employees of all MKS of the republic participated in the trainings.

In connection with the implementation of the measures provided for in the state program, one of the main issues ahead is to benefit from the advanced experience of the world's libraries and to apply the new innovation in the library.

Azerbaijan National Library Information Center "Azlib-Net" of all-republic importance was established in the Youth Library. Two systems operate in the center. The first system is VEB - the center, the second system is Electronic bulk catalog. The VEB center ensures uninterrupted operation of electronic catalogs of all libraries. It includes city and district libraries that are users of the IRBIS-64 system.

For the first time, a unique system-corporate-collective catalog system was created in the Azlibnet Center, based on the libraries of the Ministry of Culture and Tourism, which fully covers the libraries of the Republic on the basis of national resources. Databases of leading libraries are included in the collective catalog of Azlibnet's center. In the bibliographic description in the collective catalog, the books are indexed, which is the first practice in the Republic. This also shows readers which source the book belongs to during the search. Both Azerbaijani and foreign libraries that accept international standards and work with these standards have the opportunity to use this collective catalog.

Conclusıon

In result, creation of the Azlibnet center, centralization of book description in libraries, saving time and money, implementation of classification at the level of world standards, management of MKS Electronic Resources from a single center, their security, elimination of errors and duplication in the compilation of bibliographic writing, as well as provision of uninterrupted and prompt provision of resources does. Libraries now get a ready-made description of each book they collect and upload it directly to their catalog. For uninterrupted operation of the Azlibnet center and IRBIS-64 system created in the youth library, these databases are equipped with server-computers developed on the basis of high technology.

To sum up, in modern times, the intellectual needs of readers are based on universal problems.

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Therefore, modern libraries, while implementing the service process with the help of both subscription and reading rooms, should not be satisfied only with meeting the specific requests of readers, but should also direct them to be interested in innovations happening in the society.

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ISSN: 1609-1620, E-ISSN: 2674-5224; UDC: 62 (051) (0.034);
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Proceedings of Azerbaijan High Technical Educational Institutions. PAHTEI
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ISSN: 2663-8770, E-ISSN: 2733-2055; UDC: 672, 673, 67.01-67.02
DOI PREFIX: 10.36962/ETM
ETM Equipment, Technologies, Materials
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ISSN: 2733-2713; E-ISSN: 2733-2721; UDC: 33
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$$f(x) = a_0 + \sum_{n=1}^{\infty} \left(a_n \cos \frac{n\pi x}{L} + b_n \sin \frac{n\pi x}{L} \right) \qquad (1)$$

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Table should be prepare using table tool within the Microsoft word and cited consecutively in the text. Every table must have a descriptive title and if numerical measurements are given, the units should be included in the column heading. Formatting requirement has been summarized in the Table 1.

Table 1: Summary of formatting requirement for submitting paper in this journal. (Times New Roman, 12)

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Font	**Article Title**	**Headings**	**Subheadings**	**Reference list**	**Text**
	Times New Roman, 16 pt, Bold, centred	Times New Roman, 11 pt, Bold, Left aligned	Times New Roman, 10 pt, Bold, Left aligned	Times New Roman, 8 pt, Justified	Garamond, 11 pt, Justified
Line Spacing	1.15	1.15	1.15	1.15	1.15
Page number	We will format and assign page numbers				

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All figures should be cited in the paper in a consecutive order, author may be asked to provide separate files of the figure. Figures should be used in bitmap formats (TIFF, GIF, JPEG, etc.) with 300 dpi resolution at least unless the resolution is intentionally set to a lower level for scientific reasons. If a bitmap image has labels, the image and labels should be embedded in separate layer. Figure 1 shows the logo of AIJR Publisher.

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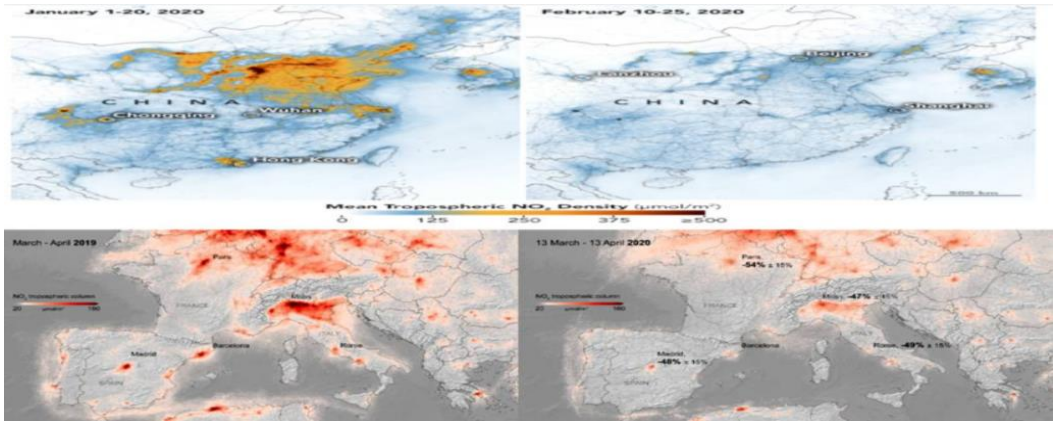

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2. Bahishti, "Peer Review; Critical Process of a Scholarly Publication", J. Mod. Mater., vol. 2, no. 1, pp. 1.1-1.2, Oct. 2016. https://doi.org/10.21467/jmm.2.1.1.1-1.2
3. Bahishti, "A New Multidisciplinary Journal; International Annals of Science", Int. Ann. Sci., vol. 1, no. 1, pp. 1.1-1.2, Feb. 2017. https://journals.aijr.in/index.php/ias/article/view/163
4. W. S. Author, "Title of paper," Name of Journal in italic, vol. x, no. x, pp. xxx-xxx, Abbrev. Month, year. Access online on 20 March 2018 at https://www.aijr.in/journal-list/advanced-journal-graduate-research/
5. W. S. Author, "Title of paper," Name of Journal in italic, vol. x, no. x, pp. xxx-xxx, Abbrev. Month, year. Access online on 5 March 2018 at https://www.aijr.in/about/publication-ethics/
6. M. Ahmad, "Importance of Modeling and Simulation of Materials in Research", J. Mod. Sim. Mater., vol. 1, no. 1, pp. 1-2, Jan. 2018. DOI: https://doi.org/10.21467/jmsm.1.1.1-2

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