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Biopsychosocial and Structural Determinants of Chemical Addictions in Prison Settings

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Abstract

Introduction: substance use disorders among prisoners are a multi-level problem caused by the interaction of neurobiological, psychological and social factors. The problem of addiction among persons in places of imprisonment is widespread and has a significant impact on both the individuals themselves and the prison system as a whole. High recidivism rates among prisoners with addictions and low efficiency of traditional approaches to rehabilitation require in-depth interdisciplinary analysis. Numerous studies indicate high levels of chronic stress experienced by prisoners, which necessitates consideration of the relationship between chronic stress and maintenance of addiction in this population. High comorbidity of addiction and incarceration necessitates a deeper understanding of the underlying factors, such as stress, to develop effective intervention strategies. *Purpose: t*o study mechanisms of addiction formation and maintenance in the penitentiary system, analyze the influence of chronic stress on neurochemical processes, cognitive-emotional patterns and social determinants, to substantiate the key importance of chronic stress compared to other factors in maintaining addiction, and to develop expanded recommendations for rehabilitation. *Methods:* an in-depth review and analysis of current scientific publications containing empirical data on the prevalence and impact of chronic stress, its relationship with addiction in convicts, and the effectiveness of various rehabilitation approaches was conducted. *Results:* it is revealed that prison conditions (sensory deprivation, limited autonomy, harsh conditions, and violence) provoke chronic stress in convicts, which aggravates neurobiological disorders (dysfunction of the dopamine system, hypercortisolemia, and suppression of neurogenesis) and epigenetic changes associated with these disorders. Chronic stress is a key factor in the maintenance and relapse of addiction, provoking cravings and contributing to the use of psychoactive substances as a means of self-medication. Psychological factors (learned helplessness, distorted time perspective, and emotional dysregulation) and social risks (stigmatization, isolation, and lack of reintegration programs) closely interact with stress, forming a cycle of maladaptation. The effectiveness of complex strategies combining psychological interventions (cognitive behavioral therapy, mindfulness therapy), social support (reintegration programs, family involvement, and mentoring) and, if necessary, pharmacotherapy is confirmed. *Conclusion*: chronic stress plays a key role in maintaining addiction in convicts. Optimization of rehabilitation requires the integration of neuroscientific data, psychocorrectional methods (cognitive behavioral therapy, mindfulness therapy, and a trauma-informed approach) and socio-environmental approaches (reintegration programs, family

support, mentors, and social workers). Promising are complex programs aimed at reducing allostatic load, developing coping strategies, restoring neuroplasticity and ensuring continuity of support after release.

Keywords: chemical dependencies; convicts; penal system; chronic stress; rehabilitation; recidivism; psychological interventions; social support.

5.3.9. Legal psychology and accident psychology.

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Introduction

In the modern world, substance use disorders (SUD) among people in prison settings are becoming a systemic crisis affecting both individual health and public safety. According to the United Nations Office on Drugs and Crime, the proportion of convicts with diagnosed addiction varies from 20% to 65% in different regions [1]. In Russia, according to official statistics from the Ministry of Internal Affairs, one in ten prisoners suffers from chemical addiction [2]. These figures do not only reflect the scale of the problem, but also emphasize its structural nature: the use of psychoactive substances (surfactants) is closely related to recidivism, since most crimes among addicts are committed either under the influence of substances or for the purpose of acquiring them [3, 4].

However, the key problem remains the lack of sufficient effectiveness of rehabilitation programs in penitentiary institutions. Traditional approaches based on isolation and forced abstinence show limited results: only 5–15% of individuals remain in remission after release [5]. The main reason lies in ignoring the complex interaction of biological, psychological and social factors that form the phenomenon of “double unfreedom”.

On the one hand, chronic stress, sensory deprivation, and limited autonomy in penitentiaries exacerbate neurochemical disorders caused by prolonged use of surfactants. Numerous studies indicate a high level of stress experienced by convicts, which requires a detailed consideration of its role [6–11]. On the other hand, maladaptive cognitive patterns and stigmatization reinforce addiction as a survival strategy. The high comorbidity of addiction and incarceration necessitates a deeper understanding of underlying factors such as stress in order to develop effective intervention strategies.

There is a practical need for evidence-based analysis and concrete actions that can be implemented to improve rehabilitation outcomes. It is important to note that this problem goes beyond prison medicine, acquiring a socioeconomic dimension. For example, in countries with high levels of inequality, such as the United States or Brazil, a lack of access to housing and employment after release increases recidivism rates [12; 13].

In this regard, the relevance of the study is determined by the need to move from repressive measures to scientifically based strategies that take into account both neurobiological mechanisms of addiction (for example, dopamine system dysfunction under the influence of stress) and structural disadvantages of penitentiary rehabilitation. The study is aimed at analyzing the relationship between neurophysiological changes (especially caused by chronic stress), psychological characteristics [14; 15] and social conditions [16], which together determine the stability of addictive behavior among convicts. Special attention is paid to an allostatic load concept, which combines biological effects of chronic stress and their impact on adaptive capacities of the individual.

The author conducts an in-depth analysis of existing scientific publications containing empirical data on this issue in order to substantiate the key importance of chronic stress in comparison with other factors contributing to the persistence of addiction in convicts. In addition, expanded recommendations for psychologi-

cal and social components of the rehabilitation model are proposed.

The results of the study are intended to become the basis for the development of integrative rehabilitation programs combining pharmacotherapy, psychocorrection and social support. Thus, the presented work contributes to an interdisciplinary dialogue linking neuroscience, clinical psychology and penitentiary practice. Its practical significance lies in the substantiation of models that can not only reduce recidivism, but also restore socio-psychological resources of people who find themselves in conditions of "double unfreedom".

Prevalence and impact of chronic stress among convicts

Empirical evidence from scientific research consistently demonstrates an increased level of chronic stress among people in prison, and numerous studies agree that the experience of incarceration is usually characterized by high levels of stress, anxiety, low self-esteem, loneliness, and depression [17–20]. In particular, the study conducted in Ghanaian prisons shows that more than half of the prisoners experience moderate or high levels of stress, while the highest levels of stress is observed among convicts serving sentences in maximum-security prisons [17].

The prison environment itself plays a significant role in the development of stress and mental health problems among prisoners. Factors contributing to stress include isolation from family and social networks [21], harsh conditions of detention, a lack of personal space, poor sanitary and hygienic conditions [22; 23], violence [24; 25] and a lack of purposeful activities. The consistency of these results across different studies and countries highlights the universality of stress as a significant factor in the prison environment.

Chronic stress has a profound psychological impact on convicts. It is associated with various psychological disorders, including anxiety, depression, self-harm, aggressive behavior, obsessive thoughts, and substance abuse. Incarceration can lead to the development of "a post-prison syndrome", similar to post-traumatic stress disorder, with long-term consequences for mental health [25]. Chronic stress can negatively affect a person's body, mind, and life, causing feelings of depression, agitation, anxiety, and apprehension. Long-term effects of chronic stress, extending beyond the period of incarceration, emphasize the need for interventions that promote psychological well-being both during and after incarceration [26].

Biological foundations: neurochemistry of addiction in the conditions of isolation and chronic stress

Chronic use of surfactants provokes profound neurobiological shifts, which are aggravated in prison conditions due to sensory deprivation, limited mobility and constant stress. The central role is played by the dysfunction of the dopamine system, which regulates motivation and the reward system. In individuals with opioid dependence, the density of D2 receptors in the striatum decreases, which weakens control over impulsive actions and increases cravings for substances. In prison, these disorders are superimposed on chronic stress, which increases cortisol levels. Hypercortisolemia suppresses neurogenesis in the hippocampus, a structure critical for memory and emotional regulation, and reduces the BDNF level (brain-derived neurotrophic factor) [27], which limits neuroplasticity and learning ability. This creates a vicious circle: stress worsens cognitive functions, which makes it difficult to overcome addiction, and addiction itself increases susceptibility to stress.

Epigenetic modifications induced by the environment perpetuate these changes [28; 29]. Hypermethylation of the DRD2 and COMT genes, which regulate dopamine metabolism, was revealed in convicts with SUD. This reduces the expression of D2 receptors and slows down dopamine metabolism, increasing its accumulation in synapses and provoking impulsivity. Such changes can persist for years, increasing vulnerability to relapse even after release.

Hyperactivation of the limbic system is another consequence of prison conditions and chronic stress. Convicts with SUD are characterized by increased activity of the amygdala, responsible for fear reactions, and decreased

activity of the prefrontal cortex, which modulates self-control [30]. This imbalance increases emotional lability, reducing tolerance to frustration and reinforcing the link between stress and the search for surfactants as a "quick fix".

Chronic stress as a key factor in maintaining addiction

The analysis of empirical data and neurobiological models suggests that chronic stress plays a key role in the emergence, maintenance and relapse of addiction in convicts [5–7]. Many people enter the prison system already having problems with addiction, and the stress associated with incarceration can exacerbate these disorders, leading to the use of psychoactive substances as a means of self-medication. A prison environment characterized by violence, isolation, and a lack of rehabilitation services can provoke or reinforce unhealthy substance use as a way to cope with difficulties. Stress can cause drug cravings and lead to relapses even after periods of abstinence during incarceration. Feelings of hopelessness, a lack of prospects for the future, and an oppressive prison environment contribute to stress and the desire to escape reality with the help of psychoactive substances.

Neurobiological models show that stress activates brain pathways involved in reward and motivation (including dopaminergic and noradrenergic systems, as well as corticotropin-releasing factor), which increases vulnerability to addiction and relapse. The cyclical nature of addiction and stress, where stress can trigger substance use, and substance use, in turn, leads to even more stress (including legal and social consequences), underscores the need to address both issues simultaneously through rehabilitation programs. Neurobiological evidence provides a compelling basis for understanding the physiological basis of stress- and addiction-related behaviors, indicating the potential effectiveness of interventions targeting these pathways.

Thus, although other factors play a role, it is chronic stress that often acts as the catalyst and supportive mechanism that prevents sustained remission in conditions of incarceration and after release.

Psychological mechanisms: maladaptation trap triggered by stress

In conditions of incarceration, addictive behavior transforms into a complex psychological phenomenon where cognitive distortions, emotional dysregulation, and institutional constraints are mutually reinforced often under the influence of chronic stress. The phenomenon of learned helplessness, described by Seligman [14], plays a central role. The systematic suppression of autonomy, the inability to influence basic aspects of life, and the chronic unpredictability of the environment form a persistent belief in the futility of effort. Studies show that convicts with SUD believe that nothing can be changed, which correlates with resistance to therapy and relapses. This cognitive pattern, aggravated by stress and feelings of hopelessness, not only reduces motivation, but also destroys self-efficacy, consolidating addiction as the only available strategy for controlling negative experiences.

The deformation of the time perspective becomes an important element. In conditions of isolation and stress, convicts are not interested in long-term planning and focus on the current moment due to neurobiological changes (depression of the prefrontal cortex under the influence of stress) [6; 30] and adaptation to an environment where the future is perceived as an abstraction. According to Ph. Zimbardo's theory, such a "narrowed" temporal orientation increases the attractiveness of surfactants as a means of immediate escapism, minimizing the significance of long-term consequences [15]. This creates a vicious circle: substances are used to suppress stress and anxiety caused by uncertainty, but their use further destroys the ability to plan.

Dysfunctional beliefs that mythologize the effects of surfactants make the situation worse. In the prison subculture, there are narratives that idealize substances as a tool for "controlling emotions" or "a symbol of resistance". These beliefs reinforced by group dynamics transform its use into a ritual that constructs meaning in an existential vacuum [31]. For example, in some prisoner communities, the use of surfactants is associated with a demonstra-

tion of strength or belonging to a group, which enhances their symbolic value.

Emotional dysregulation aggravated by chronic stress is a key driver of addiction. Convicts with SUD are often diagnosed with clinically significant anxiety and symptoms of depression. Hyperactivation of the amygdala, responsible for processing fear and increased stress, is combined with a deficiency of neurotransmitters, which reduces tolerance to frustration. Impulsivity, as measured by deferred reward tests, is often elevated [32]. When alternative coping strategies (creativity, sports, communication) are limited, the following pathological loop is formed: distress provokes the use, which, in turn, deepens emotional instability.

Adaptive strategies in the prison environment are becoming paradoxical. The use of surfactants becomes not only a coping mechanism with individual stress, but also a tool for social integration. In conditions of deprivation of basic needs (safety, belonging), substances turn into social capital, the exchange for which strengthens the status in the hierarchy of the community. For example, access to surfactants can serve as a "currency" for obtaining protection or information, which institutionalizes their use as a norm.

These processes culminate in the formation of a dependent identity, such as a stable self-representation that combines stigma ("I am an addict"), emotional fixation on surfactants, and the perception of sobriety as a threat to the social status [33]. Neuropsychologically, this is accompanied by a decrease in the activity of the medial prefrontal cortex, responsible for self-reflection [34], and hyperfunction of the insular lobe associated with bodily sensations and cravings. Such an identity is resistant to external influences, requiring a deep reconfiguration of self-narratives.

Social factors and their interaction with stress

Chronic stress is one of the key factors influencing the maintenance of addiction in convicts, but other factors also play a significant role and often interact with stress, exacerbating its effects. The social architecture of the prison system and post-release conditions catalyze addiction through stigmatization, institutional violence, social exclusion, and economic exclusion.

Social isolation caused by separation from family and friends is exacerbated by prison conditions and can lead to feelings of loneliness and hopelessness, thus increasing stress and promoting the use of surfactants as a way to cope with these emotions. Double marginalization as a "criminal" and a "drug addict" leads to systemic exclusion. So, after release, people could not find a job and accommodation. Feeling stressed, they return to the criminal environment. Within prisons, a hierarchy where dependence is associated with weakness restricts access to rehabilitation programs, perpetuating stigma.

Institutional violence (physical, psychological) is a powerful stressor correlating with increased addiction as a form of resistance or escape. In countries with repressive drug policies, overdose mortality after release is significantly higher than in regions with a medico-social approach, which is partly associated with a loss of tolerance and stress of reintegration [35; 36]. "A culture of silence" where seeking help is perceived as betrayal blocks access to support and increases feelings of isolation. A lack of opportunities for education, work, and personal growth during and after incarceration makes person feel hopeless, which also leads to stress and addiction relapse.

Economic barriers reinforce the cycle of addiction: poverty, a lack of insurance and housing significantly increase stress and relapse risks. In the United States, a significant number of released people with substance use disorder become homeless in the first year [12; 13], they criminalize or take drugs as a survival strategy under stress.

Depression, anxiety, and post-traumatic stress disorder are common among prisoners (especially given the traumatic experiences of many of them) [9–11; 25] and can be both a cause and a consequence of addiction, as well as a contributing factor to its maintenance. A trauma-informed approach is important in this context [37]. Chronic stress significantly exacerbates the state of convicts.

Thus, although social, economic, and related mental factors are important, chronic stress acts as a common denominator and amplifier that permeates all aspects of a prisoner's life and supports addiction.

Philosophical foundations: determinism, free will and ethics of responsibility

A philosophical analysis of addiction in the context of incarceration requires addressing fundamental issues of human agency, moral responsibility, and the nature of coercion. First, the contradiction between neurodeterminism and free will becomes particularly acute here. Proponents of determinism, relying on neuroscience data, argue that addictive behavior is caused by changes in the brain: decreased activity of the prefrontal cortex, dysfunction of the reward system, and epigenetic modifications [7; 28; 29]. In this paradigm, conviction for the use of surfactants becomes ethically problematic, similar to punishment for illness. However, this approach faces criticism from the existentialist tradition, which emphasizes that even under conditions of limitations, a person retains the ability to choose. As Sartre wrote, "we are condemned to be free", which in the context of prison means that a convict, despite external and internal restrictions, continues to be responsible for his/her actions.

Second, the discussion of moral responsibility touches on the ethical theories underlying penitentiary systems. Kant's deontology, which emphasizes duty and rational autonomy, justifies punishment as restoration of justice. However, if addiction deprives a person of rational control (due to prefrontal cortex dysfunction), then the punitive approach loses legitimacy. Bentham's utilitarianism offers the following alternative: punishment should be aimed not at retribution, but at preventing future harm through rehabilitation. This approach is consistent with evidence that harm reduction programs reduce recidivism more effectively than isolation [35].

Compatibilism, or "soft determinism", offers a synthesis of these positions. According to J. Fisher, even in conditions of biological predestination, a person retains "guiding control", the ability to respond to causes, which makes him\her morally responsible [38]. In the context of substance use disorder, this means that although neurochemical disorders limit freedom of choice, prisoners retain capacities for change in the presence of adequate incentives (therapy, education). For example, the use of naltrexone, which blocks opioid receptors, does not eliminate agency, but creates conditions for its implementation [5].

Neuroethics introduces new aspects to the discussion. P. Churchland's works emphasize that neurobiological data do not abolish morality, but require rethinking the criteria of responsibility [39]. If addiction is a chronic brain disease, then prison systems should focus on treatment rather than punishment [39]. This is consistent with the restorative justice model, where the focus shifts from isolation to reintegration, and dialogue between victim and perpetrator becomes a healing tool.

The historical context is also undoubtedly important: from Foucault's disciplinary institutions, where prison functions as a "normalization machine" [40], to modern concepts that consider it as a space for restoring human dignity. The philosophy of E. Levinas, which emphasizes the ethics of the "other", suggests considering prisoners not as objects of control, but as subjects whose vulnerability requires empathy and support [41].

In conclusion, the philosophical analysis demonstrates that addiction in conditions of incarceration is not just a clinical or legal problem, but an ethical challenge. A balance between responsibility and compassion can be achieved through the principle of proportionality: intervention should take into account both the degree of neurobiological limitations and the potential for agency restoration. This requires a transition from the binary logic of "guilt" and "punishment" to a comprehensive model integrating the achievements of neuroscience, ethics and social work.

Research results and discussion

The analysis revealed a set of interrelated factors that determine the sustainability of addiction in the prison system, with a special focus on the role of chronic stress.

– *Neurobiological and psychological aspects*. It is revealed that neurobiological disorders (decreased D2 receptor density, hyperactivation of the amygdala, dysfunction of the prefrontal cortex) are aggravated by chronic stress characteristic of the prison environment. Epigenetic changes (hypermethylation of the DRD2 and COMT genes) create long-term recurrence risks. Psychological mechanisms such as learned helplessness, time perspective distortion, and emotional dysregulation are closely related to stress levels and form a vicious cycle of maladaptation and addiction maintenance.

– K*ey role of chronic stress*. The analysis shows that chronic stress is not just one of the factors, but a central link reinforcing other determinants of addiction in convicts. It directly affects neurobiological pathways associated with cravings and relapse, exacerbates psychological vulnerability (anxiety, depression, impulsivity) and makes an individual more susceptible to negative social influences (stigma and isolation). Stress of incarceration can both initiate the use of surfactants as a coping mechanism and provoke breakdowns in individuals trying to maintain remission. It is the systemic and prolonged effects of stress in conditions of limited coping resources that explains its key role in maintaining dependence in this population, surpassing other individual factors in its integrating effect.

– *Social factors and the need for comprehensive interventions*. Social factors such as stigmatization, a lack of reintegration programs, and economic exclusion create an environment conducive to recidivism, especially under stress after release. The experience of countries implementing comprehensive support programs (education, employment, and accommodation) demonstrates a significant reduction in recidivism, confirming the importance of environmental modifications and the social component of rehabilitation.

– *Effectiveness of interventions*. An analysis of the literature confirms the effectiveness of integrated approaches. Psychological interventions such as cognitive behavioral therapy (CBT) and mindfulness practices have proven effective in reducing stress, cravings, and preventing relapses in prisoners. Social programs that include support after release, family involvement, mentoring, and active participation of social workers and volunteers play a critical role in successful reintegration and maintenance of remission. If necessary, pharmacotherapy is used.

Recommendations for the implementation of the psychological component of rehabilitation

To reduce chronic stress and improve remission outcomes in prisoners with addictions, it is advisable to include the following specific programs in the psychological component of the rehabilitation model:

– *CBT*: Increased access to individual and group CBT sessions tailored to prison conditions. Focus on identifying and changing negative thought patterns related to stress and addiction, and development of craving management skills. Use of the following techniques: keeping a thought diary, functional behavior analysis, cognitive restructuring, coping skills training, relapse prevention, self-control, and problem solution training.

– *Mindfulness practices*. Implementation of mindfulness-based programs, including meditation, yoga, and specialized protocols such as Mindfulness-Based Relapse Prevention (mindfulness practices with cognitive behavioral strategies, MBRP). These practices help reduce stress levels, improve emotional regulation, increase awareness of addiction triggers, and develop non-judgmental acceptance. MBRP protocols can be adapted to prison conditions.

– *Support groups*. Organization of regular support groups, including self-help and therapeutic groups under the guidance of psychologists. Provision of a safe space to share experiences, receive emotional support, and develop a sense of community.

– *Trauma-informed approach*. Integrating principles of a trauma-informed approach into all aspects of rehabilitation, given the high prevalence of trauma among prisoners with addictions. This includes staff training, injury screening, creating a safe environment, and the use of trauma-specific interventions.

– *Development of coping skills*. Targeted training of prisoners in effective stress management strategies: relaxation techniques, self-regulation, problem solving, and self-esteem enhancement.

– *Positive psychological interventions*. Realization of programs for developing psychological well-being and personal strengths, which can improve psychological well-being in prison.

Recommendations for implementing the social component of rehabilitation

The implementation of a social component to improve remission outcomes of dependent convicts may include the following actions, programs, and agents of influence:

– *Release support programs*. Development of comprehensive programs for ensuring continuous support during the transition from prison to society. They include assistance in finding stable accommodation and a job, access to medical (including treatment for addiction and mental disorders) and social services, and reissuance of documents. Examples: the Salvation Army's Pathway Forward Program, the University of North Carolina's FIT Program.

– *Family involvement*. Integration of family members into the rehabilitation process (with the consent of the convicted person). Providing family therapy, training, and support groups for relatives in order to improve relationships, reduce stress in the family, and create a supportive home environment for recovery.

– *Mentoring programs*. Creation and support of programs where successfully rehabilitated former prisoners (mentors) provide practical and emotional support to those released. Mentoring promotes social integration, gives hope, and reduces feelings of isolation and relapse risks.

– *Educational and professional programs*. Expanding access to high-quality educational (including basic and higher education) and professional programs (vocational training in sought-after specialties) both during imprisonment and after release. This increases self-esteem, competitiveness in the labor market, reduces economic stress and relapse risks.

– Agents of influence:

Social workers: strengthening the role of social workers in penitentiary institutions and probation services. They coordinate reintegration planning, connect with the necessary resources, provide psychosocial support, and help navigate the social services system.

Volunteers: attracting trained community volunteers (including recovering addicts) to provide informal support and conduct recreational activities, and self-help groups.

Mutual aid groups: providing access and support for the functioning of alcoholics anonymous and narcotics anonymous groups both within institutions and in the community after release.

Community organizations: cooperation with NGOs and religious organizations that provide reintegration services (housing, food, legal aid, and support groups).

Conclusions

Based on the analysis, it can be concluded that effective rehabilitation of people with substance use disorders in the penitentiary system requires a multi-level approach integrating the achievements of neuroscience, psychology and social work and focusing on managing chronic stress.

1. *Recognizing the key role of stress.* It is necessary to recognize that chronic stress is a central factor supporting addiction in convicts and to make its reduction and management a priority task of rehabilitation programs.

2. *Integration of the biological component*. Neurobiological consequences of chronic stress should be considered. If necessary, use pharmacotherapy (for example, naltrexone to reduce cravings for opioid addiction) and methods that stimulate neuroplasticity.

3. *Implementation of comprehensive psychological programs*. It is necessary to ensure broad access to evidence-based psychological interventions, such as cognitive behavioral therapy and mindfulness practices adapted to prison conditions and aimed at developing stress coping skills. It is possible to integrate a trauma-informed approach into all aspects of psychological care.

4. *Development of the social component and long-time support*. The key condition is transformation of the environment and support after release. It is necessary to work out reintegra-

tion programs (housing, work, and education), strengthen social ties (family, mentoring), and actively involve social workers and volunteers. It is important to ensure a "seamless" transition and continuity of treatment and support after release.

5. *Multi-level approach*. Successful rehabilitation is possible only with the synthesis of three components:

– biological (pharmacological and non-pharmacological correction of neurochemical dysfunctions caused by addiction and stress);

– psychological (formation of adaptive patterns of thinking, behavior and coping with stress);

– social (creating a supportive environment and conditions for reintegration that eliminate stigma and marginalization).

This approach is not only consistent with the principles of evidence-based medicine and the best international practices [42], but also responds to the ethical challenges associated with the problem of addiction in prison, offering a way to restore human and social capital. The implementation of these recommendations will make it possible to create a more effective and humane rehabilitation system that helps reduce stress levels, prevent relapses of addiction, and successfully reintegrate convicts into society.

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