

Modern methods and means of physical culture in the rehabilitation of various population groups: a systematic review

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Abstract

Background and Study Aim The influence of physical culture on the health improvement of various population groups requires analysis and the search for promising research directions. At the same time, the methods and means of physical culture used in rehabilitation are diverse and need systematization and clarification. The aim of the study is to review contemporary methods and means of physical culture applied in the rehabilitation of various population groups. Additionally, the study aims to identify trends and promising research directions

Material and Methods The study involved searching for articles within the Web of Science (WoS) database for the period from 2014 to 2024. The initial search using the keyword “physical culture” and its variations yielded 1198 documents. A refined search with the keyword “rehabilitation” and its variations resulted in 70 articles. The data were exported in Plain text format. For preliminary processing of the extracted references, the PyCharm CE development environment and custom Python scripts were used. Descriptive statistics and content analysis methods were applied for data analysis.

Results The most cited articles and eight key research themes in the field of physical rehabilitation were identified. The main results indicate that contemporary rehabilitation technologies and methods of adaptive physical rehabilitation significantly improve the physical and psychological health of various population groups. The importance of pedagogical, psychological, and social aspects in the training of rehabilitation specialists was also highlighted.

Conclusions Modern methods and means of physical culture in rehabilitation prove their effectiveness in improving physical and mental health, promoting social integration, and enhancing the quality of life for various population groups. The study emphasizes the need for continuous innovation and comprehensive training of specialists who integrate physical and psychological rehabilitation strategies.

Keywords: health, pedagogical, rehabilitation, adaptive

Introduction

Effective physical rehabilitation for various population groups requires a systematic and interdisciplinary approach. Analyzing contemporary research in the fields of physical culture and rehabilitation allows us to identify the most effective methods and develop standardized approaches capable of providing quality assistance to the population. In this context, knowledge and understanding of the current state and future prospects of physical rehabilitation are crucial, as they help find ways to improve the quality of life and health of the population. Several research directions stand out in particular.

Modern rehabilitation technologies play a key role in restoring health and functional abilities of various population groups. The application of therapeutic physical culture in the rehabilitation

of children has demonstrated significant improvements in motor activity [1, 2, 3]. The comprehensive use of this approach, including massage, physiotherapy, and mud therapy, has shown effectiveness in children's rehabilitation [4, 5, 6]. In these approaches, static exercises have been beneficial in preventing dysfunctions in children [7]. In turn, rehabilitation programs using Callanetics have contributed to the improvement of the cardiovascular system in students with scoliosis [8]. Another study confirmed the effectiveness of rehabilitation programs for security and defense sector employees injured in the line of duty [9]. Additionally, the development of high-tech devices and programs for rehabilitation is considered a promising direction, emphasizing the importance of an interdisciplinary approach [10, 11].

Adaptive physical rehabilitation involves the use of physical culture methods to improve the health conditions of individuals with various limitations. Research shows that adaptive physical

culture can foster a conscious attitude towards one's abilities and help overcome psychological barriers [12, 13]. Involving children with disabilities in physical activity programs can reach 81.4% with sustained government regulation [13]. Another study demonstrated that physical exercises for people with hearing impairments contribute to their social adaptation and comprehensive development [14]. Study by Kornev et al. [15] notes that increasing physical activity in children with intellectual disabilities improves their physical fitness and motivation. Study by Kopzhanov et al. [16] emphasizes the importance of professional training for specialists in adaptive physical culture and sports. The authors note that such an approach expands opportunities for people with disabilities, providing them with more chances to participate in various physical activities and sports.

It is well known that physical exercises have a significant impact on the health and quality of life of various population groups. Research by Razmakhova et al. [17] identified gender differences in the quality of life of students exempted from physical education for medical reasons. The authors emphasize the need for preventive measures and lifestyle changes. Another study [18] notes the dependence of public health on political systems, highlighting the importance of government control for the successful functioning of the social healthcare system. Golovina et al. [19] showed that monitoring the attitudes of elderly women towards physical training revealed the positive impact of physical exercises on overall health and the reduction of cardiovascular risk factors. In another study [20], methodological approaches to preparing youth for organizing leisure and recreational activities through health fitness and tourism increased the motivation levels and overall readiness of future specialists in physical culture and sports. Esaulenko et al. [21] identified the main health problems of medical university students and proposed novel approaches to organizing medical care, emphasizing the need for innovative forms and the development of a unified health management model for students.

Studies reveal various aspects of pedagogical training for specialists in physical rehabilitation. Zaitseva et al. [22] developed a methodological system for using fitness technologies in physical education for students. The system includes motivational-target, content-organizational, technological, and control components. Another study confirmed positive changes in the level of physical activity and professional motivation of students [23]. Additionally, the effectiveness of socio-pedagogical experimental learning, which demonstrated positive social and educational effects, was confirmed in another study [24]. Zhamardiy et al. [25] developed methods for forming leadership

competencies in future physical education teachers, showing positive changes in students' leadership skills. These and other studies [26, 27] also emphasize the importance of pedagogical training in various aspects of physical culture and sports, including the optimization of individual student work and the use of educational computer programs for diagnosing the functional state of the body.

Despite the considerable progress achieved in rehabilitation through the methods and means of physical culture, unresolved issues remain. These aspects highlight the importance of continuing the systematic study and application of physical culture methods and means to ensure quality rehabilitation for various population groups.

The aim of the study is to review contemporary methods and means of physical culture applied in the rehabilitation of various population groups. Additionally, the study aims to identify trends and promising research directions.

Materials and Methods

Data Sources

For this study, a search for scientific articles was conducted within the Web of Science (WoS) database for the last 10 years, from 2014 to 2024. The search was performed using the keywords: "physical culture" OR "Physical culture" OR "Physical Culture" OR "physical Culture". The initial search phase yielded 1198 documents. Subsequently, a refined search was conducted using the keywords: "Rehabilitation" OR "rehabilitation" OR "Rehab*" OR "rehab*". This refinement reduced the number of results to 70 articles. The data from WoS were exported in Plain text format, specifying the main source elements, using the option: Export → Plain text file → Record Content: → Custom selection (9) Edit. The resulting list was saved with the main source elements indicated.

Data Processing

For preliminary processing of the extracted references, the PyCharm Community Edition (CE) development environment and custom Python scripts were used. This process included the following stages:

1. Importing data from the exported text file into the Python environment for further processing.
2. Using Python scripts for data cleaning, removing duplicates, and extracting key information (e.g., article titles, publication years, keywords, and abstracts).
3. Conducting an analysis of the obtained data to determine key directions and themes represented in the selected articles.
4. Systematizing the analysis results into tables for further use in the study.

Statistical Analysis

Methods of descriptive statistics were used for the synthesis and interpretation of data in the review article. The focus was on the quantitative and qualitative analysis of the selected articles, including counting the frequency of key themes and assessing their significance. Content analysis was applied to identify the main directions and trends in the research. All analyses were conducted using data processing and analysis software, such as Python and its libraries.

Results

Table 1 contains a quantitative analysis of the frequency of various keywords in the studied scientific articles, found in the Web of Science database from 2014 to 2024. These keywords were selected to identify the main themes and directions in the field of physical culture and rehabilitation. Table 2 provides the most cited articles on the topics of physical culture and rehabilitation. Table 3 presents the main themes presented in the articles studied.

Table 1. Descriptive Statistics: Frequency of Mention of Key Themes

| Keyword | Count |
|----------------|-------|
| physical | 48 |
| culture | 14 |
| rehabilitation | 14 |
| students | 12 |
| children | 10 |
| education | 9 |
| training | 9 |
| health | 8 |
| sports | 6 |
| activity | 5 |

Table 3 demonstrates that the studies cover a wide range of issues related to the application of physical culture methods and means in rehabilitation.

Table 3. Key Research Topics in the Field of Physical Rehabilitation

| Serial Number | Paper Title (ID) | Insight |
|---------------|------------------------------------------------|------------------------------------------------------------------------|
| 1 | 1, 2, 4, 5, 9, 10, 11, 37 | Application of modern rehabilitation technologies |
| 2 | 12, 13, 14, 15, 16, 38, 39, 40 | Use of adaptive physical rehabilitation |
| 3 | 17, 18, 19, 20, 21, 41, 42, 43, 44 | Impact of physical exercises on health and quality of life |
| 4 | 22, 23, 24, 25, 26, 27, 45, 46, 47, 48, 49, 50 | Pedagogical aspects of training specialists in physical rehabilitation |
| 5 | 1, 2, 4, 5, 9, 10, 11, 51, 52, 53, 54 | Rehabilitation of specific population groups |
| 6 | 12, 14, 19, 55 | Psychological aspects of physical rehabilitation |
| 7 | 10, 11, 24, 56, 57, 58, 59, 60 | Innovative methods and technologies in rehabilitation |
| 8 | 13, 14, 16, 61, 62, 63, 64 | Social aspects of physical activity |

Discussion

The aim of the study was to review contemporary methods and means of physical culture applied in the rehabilitation of various population groups. The analysis of the frequency of key themes mentioned in studies over the past ten years showed that the most frequently occurring terms were “physical culture,” “rehabilitation,” “students,” “children,” “education,” “training,” “health,” “sports,” and “activity.” These results align with the existing literature, which emphasizes the importance of physical culture and rehabilitation in various contexts. The most cited articles also confirm the significance of these themes, highlighting the importance of innovations and methodologies in improving rehabilitation processes.

The review identified key themes highlighted in physical rehabilitation studies. These themes represent the main directions and trends in the field of rehabilitation and underscore the importance of innovative methods and approaches for improving the health and quality of life of various population groups.

Application of Modern Rehabilitation Technologies

Modern rehabilitation technologies, such as hydrokinetic therapy and CrossFit, indicate improvements in the physical condition of various population groups [1, 2]. Authors emphasize the significance of innovations in rehabilitation processes. It is also asserted that such approaches contribute to better treatment outcomes and overall functional capacity of the population [1, 2]. Other studies note that the implementation and application of these technologies are becoming important directions in the field of physical rehabilitation [4, 5, 9, 10, 37]. In these contexts, the need for further research and the development of new methodologies is evident.

Use of Adaptive Physical Rehabilitation

Adaptive physical rehabilitation remains one of the most in-demand approaches for meeting

Table 2. Most Cited Article Characteristics

| Source | Citation Count | Study Participants or Target Population | Study Design | Main Result or Issue | Author(s) Stated Conclusion |
|--------|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| [28] | 24 | Population of all Northern countries | Review | <p>“In the case of progressive hypothermia in the human body, a number of negative reactions occur, leading to a drop in temperature, depletion of physical reserves of the heart, liver, muscles, breathing and heartbeat, reduce the tone of vessels and reduce the blood flow rate.”</p> <p>Experimental participants “managed to significantly increase the body’s resistance to physical exertion and hypoxia, as well as significantly increase the functional activity of their cardiovascular system” compared to control participants.</p> | <p>“Physical rehabilitation after the action of the cold should be carried out very actively. Its success is associated with the complexity and perseverance of the use of therapeutic physical culture, massage, and various physiotherapy.”</p> <p>“The effectiveness of the author’s scheme of therapeutic physical culture was significantly higher than the results of applying the traditional scheme in terms of rehabilitation of this patient population.”</p> |
| [29] | 21 | 45 men (age range 45 to 60) who experienced “a small focal myocardial infarction in the posterior or anterolateral walls of the left ventricle 5-6 days ago without signs of heart failure.” | Experimental | <p>“The therapeutic physical culture allows restoring movements in the lower limb, reduces swelling of the injured leg, prevents the development of traumatic flat feet, deformities of the foot and the curving of the fingers, restores the functions of the damaged limb and the movement skill. Massage promotes acceleration of regeneration processes at the site of fracture and elimination of stiffness. To restore the functions of the lower limb, the combination of massage with mud therapy, apparatus physiotherapy and mechanotherapy has a good effect. Also, to achieve full recovery of lost function of ankle joints, an increase in motor activity in the form of soccer can be used.”</p> | <p>“The success of rehabilitation with this pathology is possible when using complex therapeutic physical training, therapeutic massage, physiotherapy.”</p> |
| [4] | 20 | Lower limb injured children in need of rehabilitation with Down’s syndrome | Review | <p>“The therapeutic physical culture allows restoring movements in the lower limb, reduces swelling of the injured leg, prevents the development of traumatic flat feet, deformities of the foot and the curving of the fingers, restores the functions of the damaged limb and the movement skill. Massage promotes acceleration of regeneration processes at the site of fracture and elimination of stiffness. To restore the functions of the lower limb, the combination of massage with mud therapy, apparatus physiotherapy and mechanotherapy has a good effect. Also, to achieve full recovery of lost function of ankle joints, an increase in motor activity in the form of soccer can be used.”</p> | <p>“The success of rehabilitation with this pathology is possible when using complex therapeutic physical training, therapeutic massage, physiotherapy.”</p> |

Table 2 (Continued)

| Source | Citation Count | Study Participants or Target Population | Study Design | Main Result or Issue | Author(s) Stated Conclusion |
|--------|----------------|----------------------------------------------------------------------------------------------|--------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| [30] | 20 | Boys (age range 12 to 13) with either high or low self-reported high or low physical capital | Qualitative | <p>“...this paper explores the relational and performative aspects of gender in the interview space, mediating how boys with multiple body capitals and masculinities shape their narratives in different ways during an interview with a male researcher.”</p> | <p>“Overall, influenced by relational and performative aspects of gender, adolescent boys in our study performed what they understood as an ‘appropriate’ version of gender with a male interviewer. To extend methodological data about the influence of the interviewer’s gender with children and youth, future research should investigate how boys and girls perform gender during gender congruent and gender incongruent interview settings.”</p> |
| [31] | 17 | Physical culture teachers in higher education | Qualitative | <p>“...the system of RBL (Resource-Based Learning) of future teachers of physical culture was developed, which contains the following subsystems: motivational, conceptual-targeting, structural-content, process-technological, diagnostic-effective.”</p> | <p>“Theoretical and practical results obtained during research form the basis for further examination of the problem in the aspects of improving the existing system, identifying the specific ways of organizing effective cooperation with Ukrainian and foreign libraries, with international higher education institutions providing training for future teachers of physical culture, exploring the directions of development in RBL within higher education institutions and creating the new-generation universities with the means of applying innovative technologies.”</p> |
| [32] | 17 | 573 adults (55% females) enrolled being prepared as future teachers | Experimental | <p>“The main factors contributing to the positive attitude of students to the fitness technology classes are: control of the department of physical education, responsibility for the level of physical fitness, responsibility and discipline...” and “The most attractive factor for the pursuit of fitness technology in the after-school hours is the accessibility and comfort of sports facilities...”</p> | <p>“Therefore, students’ physical improvement needs are a mental state characterized by an attraction to practising fitness to develop their physical qualities and promote health. The vital need to meet such needs leads to a student’s motive for action.”</p> |

Table 2 (Continued)

| Source | Citation Count | Study Participants or Target Population | Study Design | Main Result or Issue | Author(s) Stated Conclusion |
|--------|----------------|------------------------------------------------------------------------------------------------------------|----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| [33] | 16 | Youth who sustained a lower jaw fracture | Review | <p>“Regular physical education should be of great importance in the development of rehabilitation options for a fracture of the lower jaw. It provides a good healing effect, especially when combined with several physiotherapeutic and psychotherapeutic effects.”</p> <p>“Firstly, that qualitative researchers of sport and physical culture continue to offer self-reflexive accounts of undertaking projects in total institutional (or total institution-like) sport settings. The recent work of Parker (2016) and Allain (2014) represents notable exemplars of such an approach. Secondly, that discussions continue within sports studies about methodological challenges and frustrations, as well as creative methodological and theoretical approaches to overcoming or working around these barriers.”</p> | <p>“The continuing need to accelerate and increase the efficiency of the rehabilitation process after a fracture of the mandible requires further extensive research in this direction.”</p> |
| [34] | 13 | Canadian adult prison population | Self-reflective case study | <p>“Attention to CR goals was not always the primary consideration for study participants. Instead, a central concern was to restore social dignity within other fields of activity, including family, friendships, and employment. Thus, study participants evolved improvised tactical approaches that combined both physical and social rehabilitation. These improvised tactics were socially embedded and blended new cultural capital with existing (often gendered) cultural capital and included: concealment, mobilizing cooperation, re-positioning, and push-back.”</p> | <p>“This paper fills a unique void in the literature on sport research in total institutions, offering a critical and reflexive methodological examination of the barriers to qualitative research at such sites.” Sites refers to federal prisons.</p> |
| [35] | 13 | 32 (50% female) cardiac rehabilitation patients with diabetes within the initial 3 months of their program | Qualitative | <p>“...Western mind–body exercise methods enjoyed celebrated success during the first half of the 20th century, were hailed by medical and allied health practitioners and practiced by millions from society’s elite to deprived minorities.”</p> | <p>“Our findings suggest that success in CR requires certain baseline levels of capital – including embodied, often gendered, cultural capital – and that efforts to follow CR recommendations may alter social positioning.”</p> |
| [36] | 11 | Healthcare professionals | Review | <p>“Rediscovering the Western mind–body exercise movement is hoped to facilitate official healthcare establishment recognition of this kind of training as an integral entity.”</p> | |

the individual needs of various population groups with disabilities. Current research highlights the importance of government programs and sustainable regulation for involving children with disabilities in physical activity [13]. The significance of professional training for specialists in this field is also noted, as it expands opportunities and improves the quality of life for people with disabilities [16]. Many studies in the field of adaptive rehabilitation demonstrate new approaches that promote social adaptation and improve the physical condition of the population [12, 14, 15]. The results of these and other studies [38, 39, 40] indicate the need for continued efforts to find more effective approaches to addressing the challenges of adaptive physical rehabilitation.

Impact of Physical Exercises on Health and Quality of Life

Physical exercises hold a special and important place in the physical rehabilitation of people of different ages. Physical exercises significantly impact the improvement of health and quality of life for various population groups. Research highlights the importance of preventive measures to eliminate gender differences in the quality of life of students [17], government control over healthcare for the successful functioning of society [18], and reducing cardiovascular disease risks in elderly women through physical activity [19]. The necessity of new methodological approaches in preparing students for health-related activities [20] and improving the organization of medical care for medical university students [21] is also noted. Other studies [41, 42, 43, 44] confirm the validity of such approaches regarding the impact of physical exercises on the health and quality of life of various population groups. These aspects emphasize the importance of a comprehensive approach to physical activity and population health, contributing to the further improvement of quality of life.

Pedagogical Aspects of Training Specialists in Physical Rehabilitation

The training of specialists in physical rehabilitation requires the application of person-centered, active, and axiological approaches that promote professional development and motivation among students [22]. Current research emphasizes the need to modernize the content and forms of teacher training and to implement experimental methodologies for developing leadership competencies [24]. Additionally, the use of information and communication technologies to enhance educational processes is highlighted [27]. Special attention is given to intensifying the educational and corrective process for schoolchildren with special needs [26]. Authors report that such an approach helps achieve corrective and speech therapy goals. In another study

[23], it is noted that the level of physical activity among students depends on their motivation and readiness for continuous professional development, underlining the importance of motivation in the learning process. Another study [25] points out that developing leadership skills is also a crucial aspect of training future physical education teachers. Numerous studies [45, 46, 47, 48, 49, 50] confirm the role and significance of pedagogy in training specialists in the field of physical rehabilitation.

Rehabilitation of Various Population Groups

The rehabilitation of specific population groups includes specialized programs that improve physical condition and quality of life. Current research highlights the importance of a comprehensive approach, incorporating therapeutic physical culture, massage, physiotherapy, and pharmacological agents for various groups, including the general population [1], stroke patients [2], and office workers [9]. It is emphasized that inclusive tourism [10] and interdisciplinary educational programs also play a key role in enhancing rehabilitation processes and ensuring the quality training of specialists [11]. Another study [4] notes that a rehabilitation program for children with Down syndrome and lower limb injuries contributed to functional recovery and health normalization. In a study by Kalmykov et al. [5], a program for patients with chronic gastritis is presented, showing effectiveness in functional recovery and health normalization. The authors of these and other studies [51, 52, 53, 54] largely support and welcome approaches that consider the age-specific characteristics of the participants.

Psychological Aspects of Physical Rehabilitation

The psychological aspects of physical rehabilitation are an important element in the system of recovery and improving the quality of life for the population. Research emphasizes that adaptive physical culture helps people with disabilities overcome psychological barriers and develop a conscious attitude towards their capabilities [12]. Additionally, physical activity plays a crucial role in the social adaptation of people with hearing impairments and in improving the cognitive abilities of elderly women, contributing to their overall well-being [14, 19]. These aspects and the results of other studies [52, 55] demonstrate the necessity of integrating psychological approaches into physical rehabilitation programs to achieve the best outcomes.

Innovative Methods and Technologies in Rehabilitation

Innovative methods and technologies are becoming increasingly important in the field of rehabilitation. They enable the discovery of new approaches to improving the quality of life for various population groups. Inclusive tourism

and high-tech training programs for specialists expand opportunities for rehabilitation and social integration of people with disabilities [10, 11]. The introduction of new pedagogical methodologies and technologies into the educational process also plays a key role in enhancing the physical and mental health of students [24, 65]. The authors of these and other studies [56, 57, 58, 59, 60] highlight the need for further development and implementation of innovative solutions in rehabilitation programs.

Social Aspects of Physical Activity

The social aspects of physical activity play a crucial role in improving the quality of life and social integration of various population groups. Government regulation and support for physical activity programs for children with disabilities are essential factors that ensure high involvement and successful implementation of these programs [13]. Regular participation in physical activity helps improve physical condition and develop social skills and promote social adaptation, especially in people with hearing impairments [14]. The importance of professional training for specialists in adaptive physical culture is also indisputable. In study [16], it is noted that such an approach expands opportunities for people with disabilities, enhancing their quality of life and promoting successful social integration. These and other studies [61, 62, 66, 67, 68, 69, 70] emphasize the significance of regular physical exercises and the qualified training of specialists to achieve sustainable results in improving the health and quality of life of various social groups.

Limitations of the Evidence Included in the Review

The limitations of the evidence in this study are related to the use of data solely from the Web of Science database. This may limit the representativeness of the sample, as not all relevant studies may be included in this database. Additionally, only articles published in English were included in the review. This may also limit the comprehensiveness of the analysis, considering the

possible existence of significant studies in other languages.

Implications of the Results for Practice, Policy, and Future Research

The results of this study have important implications for practice, policy, and future research in the field of physical culture and rehabilitation. The identified key themes and methods can be used to develop and improve physical education and rehabilitation programs. This approach will contribute to increased motivation for physical activity and improved health among various population groups. Future research can focus on an in-depth study of the identified themes, utilizing data from other databases and sources, as well as investigating the long-term effects of applying different rehabilitation methods and technologies.

Conclusions

The conducted review highlights several key directions in the field of physical rehabilitation. Modern technologies and adaptive methods have proven effective in improving the physical and psychological condition of various population groups, including children, the elderly, and people with disabilities. Physical activity enhances health and quality of life and promotes social integration and adaptation.

Pedagogical training of specialists in physical rehabilitation also plays an important role. The implementation of innovative methods and technologies is necessary to increase the effectiveness of rehabilitation programs. Training specialists should consider both physical and psychological aspects of rehabilitation, ensuring a comprehensive approach to health recovery.

Future research should focus on further exploring and developing these directions. This will improve the quality and accessibility of rehabilitation services and develop new methods and approaches for successful rehabilitation and social integration.

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