UDC 616–71
DOI https://doi.org/10.32782/2077-6594/2025.3/20

Horoshko V.I.[1], Horoshko A.I.[2]

Innovative technologies of mobile applications in rehabilitation practice: personalised approach to restoring body functions

[1]National University of Water and Environmental Engineering, Rivne, Ukraine
[2]Technische Universität Graz, Graz, Austria

Горошко В.І.[1], Горошко А.І.[2]

Інноваційні технології мобільних застосунків у реабілітаційній практиці: персоналізований підхід до відновлення функцій організму

[1] Національний університет водного господарства та природокористування, м. Рівне, Україна
[2]Технічний університет Граца, м. Грац, Австрія

talgardat@gmail.com

Introduction

Mobile applications have become an integral part of modern medicine, especially in the field of rehabilitation [1; 2]. Their use ensures accessibility, a personalized approach, and continuous monitoring of patients. In today's world, where technology is developing rapidly, mobile applications help to simplify the treatment process, and also make it more effective and convenient for patients [3]. Social support plays an important role in ensuring the availability of mobile phones for people with special needs. Due to social programs, many people have the opportunity to purchase mobile phones and are able to use mobile applications for rehabilitation [4]. According to statistics, the use of assistive technologies among people with disabilities is growing, which indicates positive changes in the field of digital inclusion. Due to mobile applications, patients can receive rehabilitation services anytime and anywhere, which is especially important for people with disabilities [5; 6; 7]. Specialists can constantly monitor the health of patients, adjust treatment and provide recommendations in real time, which not only improves the quality of medical services, but also contributes to a faster recovery of patients. With the growing demand for rehabilitation services, technology solutions are opening up new horizons for professionals and patients. Innovations in mobile applications are improving the quality of life of people undergoing rehabilitation and making medical services more accessible [8; 9].

The relevance of the study of innovative mobile application technologies in rehabilitation medicine is due to several factors, namely the growing number of patients in need of rehabilitation services due to the increase in life expectancy and the number of people experiencing diseases, injuries or surgeries [10], and the development of technologies that can significantly improve the quality of medical services and ensure access to them for a wider range of patients, including those living in remote areas or with limited mobility [11; 12]. The personalized approach provided by mobile applications makes it possible to adapt rehabilitation programs to the individual needs of each patient, considering their characteristics, progress and response to treatment. This, in turn, helps to increase the effectiveness of rehabilitation, reduce renewal time and improve the overall quality of life of patients. In addition, mobile technologies provide continuous monitoring of patients' health, which allows for timely detection and correction of possible complications. The use of such technologies also reduces the workload of medical personnel, enabling them to focus on providing more complex medical services and increasing the overall efficiency of medical institutions [13; 14].

Therefore, research into innovative mobile application technologies in rehabilitation medicine is an extremely relevant and promising area that opens up new opportunities for improving the quality of medical services, increasing the efficiency of rehabilitation, and ensuring greater accessibility of rehabilitation programs.

The purpose of the article is to assess the effectiveness and reasonability of using mobile applications as a tool for personalized rehabilitation.

Object, materials and research methods

This study used a systematic literature review method. The search for scientific sources was conducted in such databases as PubMed, Scopus and Google Scholar. The search queries included the keywords: mobile applications, rehabilitation medicine, personalized approach, telerehabilitation and physical therapy. The selection of articles was carried out according to the following criteria: publication in peer-reviewed journals, articles in English, studies conducted in the last ten years (2014–2024).

A structured questionnaire method was used to survey physical and rehabilitation medicine physicians, physical therapists, and occupational therapists. The developed questionnaire contained 20 questions

covering the following aspects: experience using mobile applications in rehabilitation, assessment of the effectiveness and convenience of the applications, advantages and disadvantages of mobile technologies, and suggestions for improving the functionality of the applications. The survey was conducted online using the SurveyMonkey platform. The study involved 76 experts, whose data was processed and analyzed to determine general trends and professional opinions.

Selected free mobile applications were tested in clinical settings involving patients of all ages (18 to 68 years old, 128 females, 149 males) and with different pathologies. Patients used PhysiApp, RehabCoach and Kaia Health applications in their daily rehabilitation practice. The effectiveness of the applications was assessed based on data on the improvement of patients' condition, the duration of the rehabilitation period and user satisfaction.

The following statistical analysis methods were used to evaluate the effectiveness of mobile applications: descriptive statistics to describe the main characteristics of the sample, such as average age, gender structure, distribution by age groups and nosologies; Student's t-test to compare the average values of indicators before and after using mobile applications; correlation analysis to determine the relationship between the use of mobile applications and the results of rehabilitation; regression analysis to assess the impact of various factors on the effectiveness of rehabilitation using mobile applications.

The study involved 277 patients, including 128 females and 149 males, aged 18 to 68 years. The patients were divided into three age groups: 18–30 years (109 people), 31–50 years (98 people), and 51–68 years (70 people). By nosology, the study participants included patients with musculoskeletal diseases (100 people), cardiovascular pathologies (100 people), and neurological disorders (77 people). The participants were randomly assigned to groups. The process of assigning participants to groups was concealed from the specialists involved in the rehabilitation process. All groups had similar baseline characteristics at the beginning of the trial. Participants did not know which intervention they were receiving. The evaluators collecting the outcome data did not know which intervention was performed. The percentage of participants who completed the study was 92%. The analysis of the results included all participants according to the initial distribution. The results were statistically analyzed to compare between-group differences. The study included reports of statistical data such as means, standard deviations, and confidence intervals.

When conducting this study, the main provisions of the «Ethical Principles for Medical Research Involving Human Participants», approved by the Declaration of Helsinki (1964-2013), ICH GCP (1996), EEC Directive No. 609 (dated 11/24/1986), orders of the Ministry of Health of Ukraine No. 690 dated 09/23/2009, No. 944 dated 12/14/2009, No. 616 dated 08/03/2012, were strictly observed.

The study materials included the following free mobile rehabilitation applications PhysiApp, which provides physical therapy through interactive video instructions, allowing patients to perform individually designed exercises, receive reminders about training, and send reports to their therapist. This application is convenient for rehabilitation after injuries, surgeries, or general improvement of motor activity. RehabCoach supports the process of telerehabilitation and remote patient monitoring, includes integrated options for communication with a therapist, personalized recommendations, and functions for tracking the patient's progress. This platform is effective for patients with musculoskeletal and cardiovascular diseases. Kaia Health is designed to manage chronic back pain and other diseases using cognitive behavioral therapy and physical exercise. It uses artificial intelligence to analyze exercise performance, provides recommendations for improving technique, and includes educational materials for patients. The application is suitable for patients with chronic pain and for those wishing to avoid or reduce the need for drug treatment. These mobile applications were selected for the study taking into account their functionality, popularity among users, and compliance with modern requirements of rehabilitation medicine. Clinical trial results from previous studies demonstrating the effectiveness of these applications in improving motor activity, reducing pain levels and improving patients' quality of life were also included.

Research results

Analyzing literary sources allowed systematizing data on the use of mobile applications in rehabilitation, their effectiveness and benefits for patients and healthcare professionals [15]. Particular attention was paid to articles describing clinical trials and real cases of using mobile technologies in medical practice [16]. This made it possible to create a solid knowledge base for further analysis and comparison with the results of the study [17]. The search for scientific sources was carried out in the PubMed, Scopus and Google Scholar databases using the keywords: mobile applications, rehabilitation medicine, personalized approach, telerehabilitation and physical therapy. The selection of articles was carried out according to the following criteria: publication in peer-reviewed journals, articles in English, studies conducted over the past ten years (2014–2024). A total of 1898 articles were reviewed (WoS=41, PubMed=43, Cochrane=84, Scopus=114, ScienceDirect=1616). A total of five studies were included in the systematic review after screening and inclusion procedures. Two studies were included in the meta-analysis for data homogeneity. PEDro scores in the trials ranged from 4 to 7 (median: 6), indicating good quality. All studies were included in the “some concern” category. In two studies, mobile app-based interventions resulted in better quality of life and patient adherence outcomes. This resulted in 50 scientific articles, reports, and clinical trials most relevant

to the research topic. The analysis process included a systematic review and classification of information presented in the selected sources. Particular attention was paid to studies demonstrating the use of mobile applications in real-life clinical settings. This included assessing the effectiveness of applications in various aspects of rehabilitation, such as improving mobility, reducing pain levels, improving patients' quality of life, and ensuring ease of use for healthcare professionals. The clinical trials included in the analysis provided detailed data on the study methods, patient population, effectiveness assessment criteria, and the results of mobile technology use. This provided a clear understanding of the benefits and possible limitations of using mobile applications in rehabilitation practice. The results of the literature review were used to create a knowledge base for further analysis and comparison with the results of the study. They also helped to identify key aspects requiring further study and improvement, and provided valuable information for developing recommendations for improving the functionality of mobile applications and their integration into rehabilitation practice.

Thus, the conducted analysis of literary sources became an important stage in the preparation and substantiation of the study, providing a scientific basis for the analysis of the impact of mobile applications on the rehabilitation process.

The study included 36 physical therapists, 11 physical medicine and rehabilitation physicians and 28 occupational therapists who assessed the effectiveness and convenience of using mobile applications in rehabilitation practice. A total of 76 specialists participated in the survey. Among the surveyed specialists, 5 physical therapists, 2 physical medicine and rehabilitation physicians and 4 occupational therapists have been working in rehabilitation for less than 1 year; 10 physical therapists, 4 physical medicine and rehabilitation physicians and 8 occupational therapists have experience from 1 to 5 years; 15 physical therapists, 4 physical medicine and rehabilitation physicians and 12 occupational therapists have been working for 5 to 10 years; and 6 physical therapists, 2 physical medicine and rehabilitation physicians and 4 occupational therapists have more than 10 years of experience.

A total of 28 physical therapists, 10 physical medicine and rehabilitation physicians, and 22 occupational therapists use mobile apps in their rehabilitation practice. Among the popular apps, 20 physical therapists, 7 physical medicine and rehabilitation physicians, and 15 occupational therapists use PhysiApp; 15 physical therapists, 5 physical medicine and rehabilitation physicians, and 18 occupational therapists use RehabCoach; 10 physical therapists, 4 physical medicine and rehabilitation physicians, and 12 occupational therapists use Kaia Health. In addition, 5 physical therapists, 2 physical medicine and rehabilitation physicians, and 6 occupational therapists use other mobile apps.

The study involved 277 patients, including 128 females and 149 males aged 18 to 68 years.

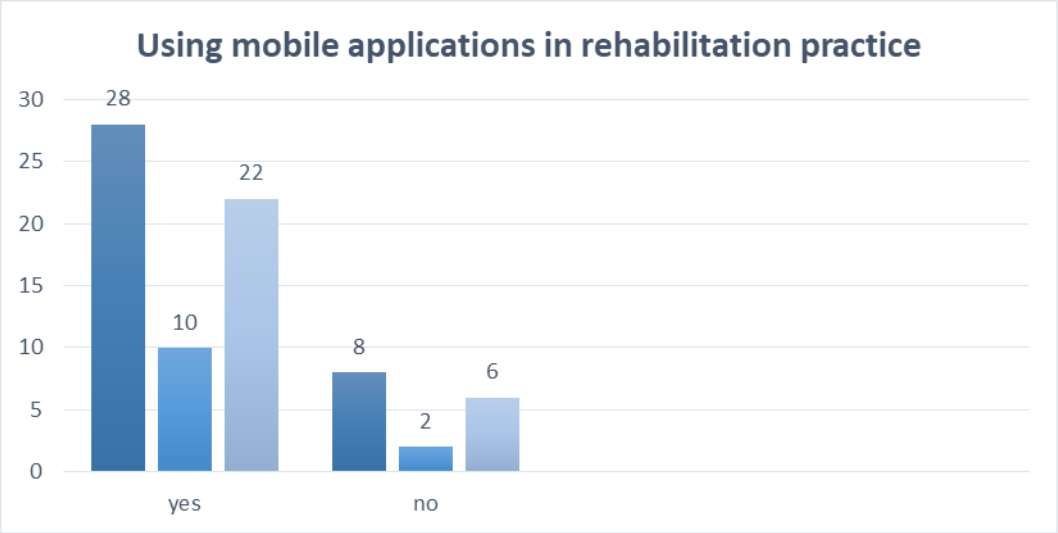

Fig. 1. Using mobile applications in rehabilitation practice

Table 1

Mobile applications used in rehabilitation practice

Application	Physical therapists	Physical medicine and rehabilitation physicians	Occupational therapists
PhysiApp	20	7	15
RehabCoach	15	5	18
Kaia Health	10	4	12
Other	5	2	6

Table 2

Distribution of patients by age group and gender

Age group	Total patients	Females	Males	Average age
18–30 years	109	55	54	24.5
31–50 years	98	45	53	40.5
51–68 years	70	28	42	59.5

Table 3

Distribution of patients by nosology and gender

Nosology	Total patients	Females	Males
Musculoskeletal diseases	106	50	56
Cardiovascular pathologies	95	42	53
Neurological disorders	76	36	40

The patients were divided into three age groups: 18–30 years (109 people), 31–50 years (98 people), and 51–68 years (70 people). This allowed us to obtain representative data for analyzing the effectiveness of mobile applications in different age categories, which is important for considering the specific rehabilitation needs of each group. Distribution of participants by age allows for consideration of various physiological and psychological characteristics that may affect the effectiveness of rehabilitation. Younger patients aged 18–30 years have greater potential for rapid recovery due to the body's higher regenerative capacity. Middle-aged patients (31–50 years) can demonstrate more stable results due to their physical fitness and discipline in completing rehabilitation programs. Older patients aged 51–68 years may face additional challenges such as comorbid conditions and reduced physical fitness, requiring a more individualized approach and ongoing monitoring [18].

The patients in the study had various medical conditions, which also affects the needs and approach to rehabilitation. Patients with musculoskeletal disorders (106 people) constituted the largest group. This category included patients with injuries, arthritis, osteoporosis and other pathologies affecting motor activity. Mobile applications such as PhysiApp have shown high efficiency in this group, providing individual physical therapy programs and monitoring of progress. Patients with cardiovascular pathologies (95 people) required special attention to monitoring physical activity and regular monitoring of health status. The use of applications such as RehabCoach allowed for continuous communication with medical specialists and adjustment of rehabilitation programs in real time. Patients with neurological disorders (76 people) received support through applications such as Kaia Health, combining cognitive behavioral therapy and physical exercise. The result was a reduction in stress levels, an improvement in motor function, and an increase in the patients` quality of life.

Table 4

Use of mobile applications by patients

Application	Total patients	Females	Males
PhysiApp	143	66	77
RehabCoach	138	64	74
Kaia Health	98	45	53

The study showed that mobile applications are effective across all age groups and nosologies. Patients noticed improvement in health, reduction in pain level and improvement in quality of life. Reminder functions, interactive instructions and the ability to receive feedback from medical workers were especially useful. Patients noticed improvement in health, reduction in pain level and improvement in quality of life. Reminders, interactive instructions, and the ability to receive feedback from healthcare professionals were particularly useful.

The use of mobile applications in rehabilitation medicine has shown high efficiency and convenience for patients of different ages and with various medical

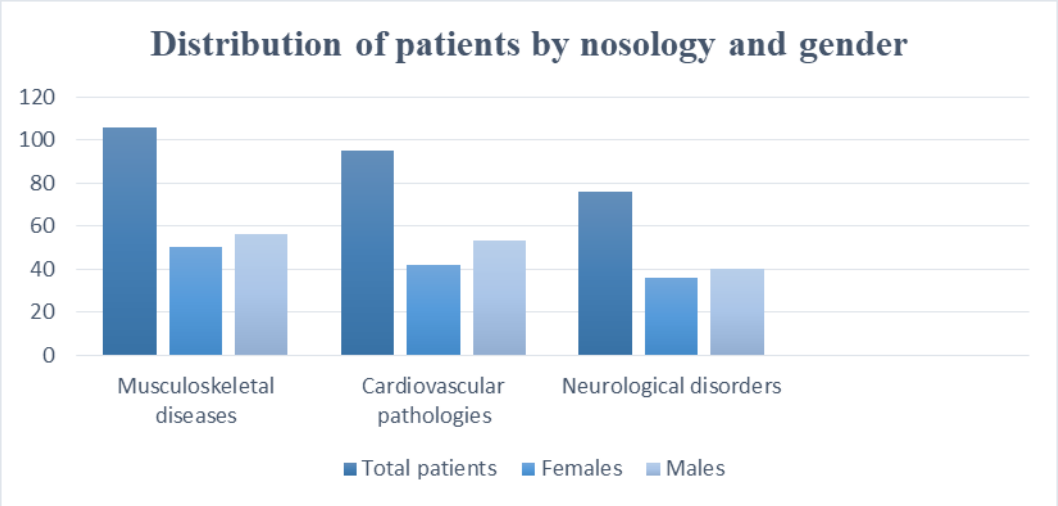

Fig. 2. Distribution of patients by nosology and gender

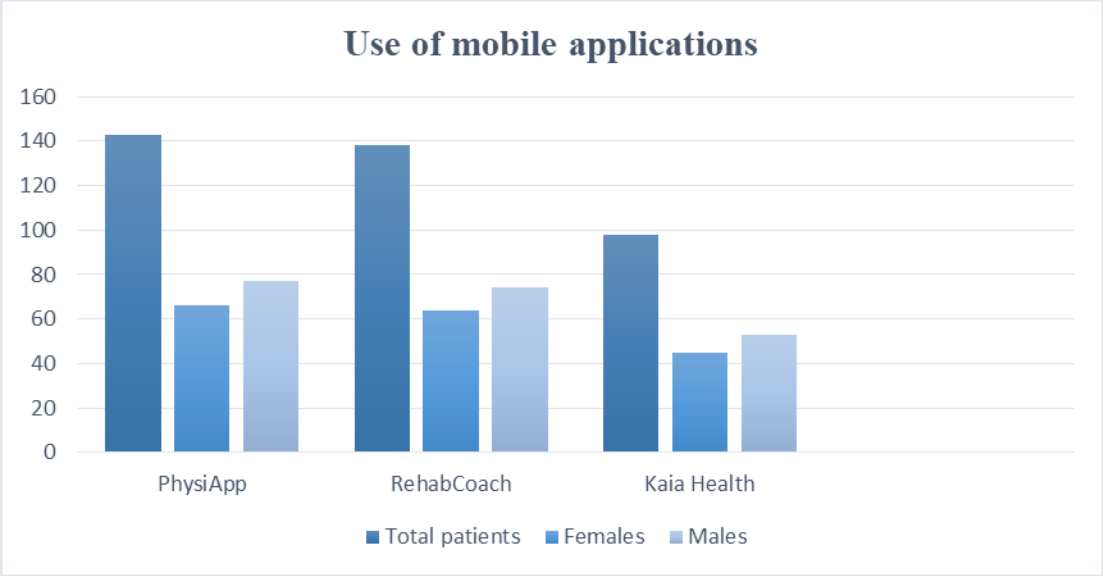

Fig. 3. Use of mobile applications by patients

conditions. This confirms the need to integrate mobile technologies into standard rehabilitation practice to ensure a personalized approach and improve the quality of medical services.

Statistical methods. The descriptive statistical method was used to describe the main characteristics of the sample, such as average age, gender structure, distribution by age groups and nosologies. These data are reflected in Tables 1 and 2. Student's t-test is a method that was used to compare the average values of indicators before and after using mobile applications, Table 5.

Table 5

Analysis of pain levels when using mobile applications

Indicator	Before application	After application	Student's t-test
Pain level (average score)	6.8	3.2	0.01
Quality of life (average score)	4.5	7.3	0.02

Correlation analysis was used to determine the relationships between the use of mobile applications and rehabilitation outcomes, Table 6.

Table 6

Relationship between the use of mobile applications in rehabilitation and pain levels and quality of life

Indicator	Correlation coefficient (r)
Use of mobile applications and pain level	-0.75
Use of mobile applications and quality of life	0.82

Regression analysis was used to assess the impact of various factors on the effectiveness of rehabilitation using mobile applications, Table 7.

Table 7

The influence of various factors on the effectiveness of rehabilitation using mobile applications

Factor	Coefficient	Standart error	P-value
Age	-0.15	0.05	0.001
Gender	0.10	0.04	0.05
Type of disease	0.20	0.03	0.01
Use of applications	0.30	0.02	<0.001

Discussion of research results

An analysis of the responses to the survey questions revealed that rehabilitation professionals were mostly positive about mobile applications. Physical therapists, physical medicine and rehabilitation physicians, and occupational therapists noted the high efficiency and functionality of mobile technologies in their practice.

Among the main benefits, 25 physical therapists, 8 physical medicine and rehabilitation physicians and 20 occupational therapists note accessibility for patients, 30 physical therapists, 10 physical medicine and rehabilitation physicians and 22 occupational therapists habilitation physicians and 24 occupational therapists – constant monitoring of patients. Ease of use was noted by 22 physical therapists, 7 physical medicine and rehabilitation physicians and 20 occupational therapists, and a decrease in the workload on medical personnel – by 15 physical therapists, 6 physical medicine and rehabilitation physicians and 18 occupational therapists. The convenience of mobile applications for patients was highly rated by 15 physical therapists, 6 physical medicine and rehabilitation physicians and 14 occupational therapists, while 18 physical therapists, 5 physical medicine and rehabilitation physicians

Table 8

Benefits of using mobile applications in rehabilitation by patients (expert opinion)

Benefits	Physical therapists	Physical medicine and rehabilitation physicians	Occupational therapists
Accessibility for patients	25	8	20
Personalized approach	30	10	22
Continuous patient monitoring	28	9	24
Convenience in use	22	7	20
Reducing the burden on medical staff	15	6	18
Other	3	1	2

and 10 occupational therapists. In terms of usability for professionals, 20 physical therapists, 8 physical medicine and rehabilitation physicians and 18 occupational therapists find them very convenient, while 12 physical therapists, 3 physical medicine and rehabilitation physicians and 8 occupational therapists find them convenient. This highlights that mobile apps meet the needs of both sides of the rehabilitation process.

A large number of professionals have noted that mobile applications are very effective and efficient in rehabilitation, highlighting their potential to improve healthcare services. The main benefits identified by professionals include accessibility to patients, personalized approach, and constant monitoring of patients. The convenience of using mobile applications for both parties in the rehabilitation process is also highly valued. This suggests that mobile technologies make rehabilitation more efficient and convenient for both patients and healthcare professionals. Patients also experience significant benefits from using mobile applications. They report improved health, reduced pain, and improved quality of life. Interactive features of mobile applications, such as video instructions and reminders, help patients become more engaged in the rehabilitation process and adhere to recommended programs.

Table 9

Mobile application functionality evaluation

Evaluation	Total patients	Females	Males
Very functional	133	62	71
Functional	110	51	59
Neutral	34	15	19

Table 10

Evaluation of mobile application usability by patients

Evaluation	Total patients	Females	Males
Very convenient	121	55	66
Convenient	113	51	62
Neutral	43	22	21

On the other hand, some experts noted technical problems and insufficient number of functions as shortcomings of mobile applications. Among the main shortcomings, 10 physical therapists, 3 physical medicine and rehabilitation physicians, and 8 occupational therapists noted technical problems, and 12 physical therapists, 4 physical medicine and rehabilitation physicians,

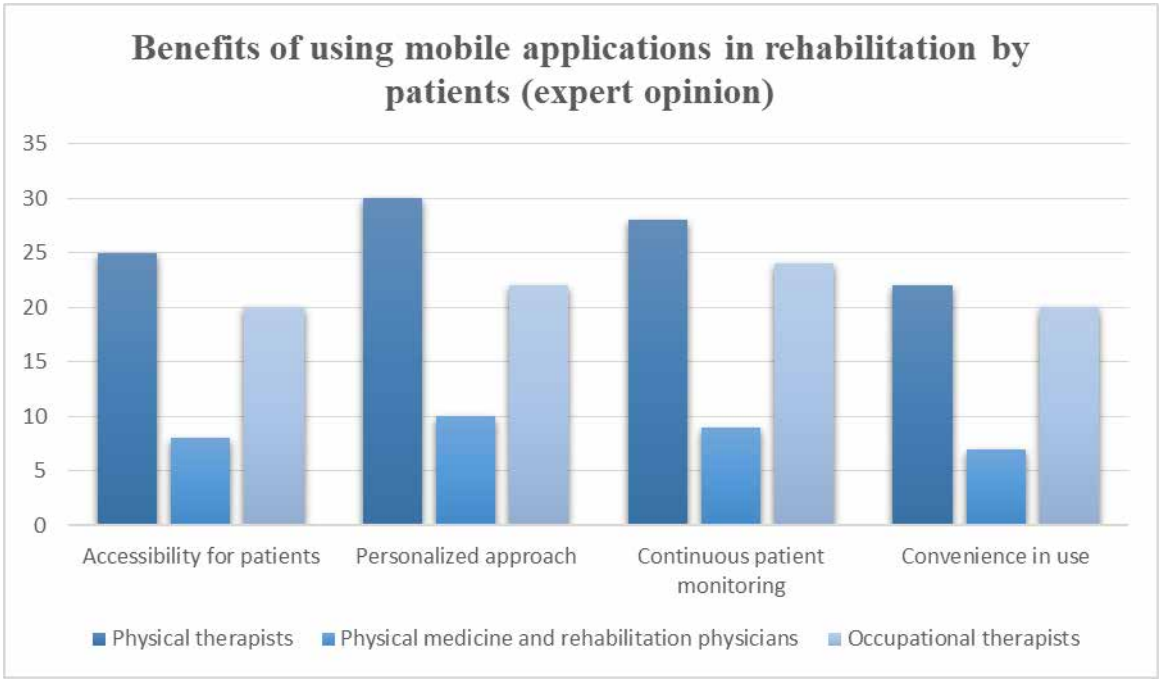

Fig. 4. Benefits of using mobile applications in rehabilitation by patients (expert opinion)

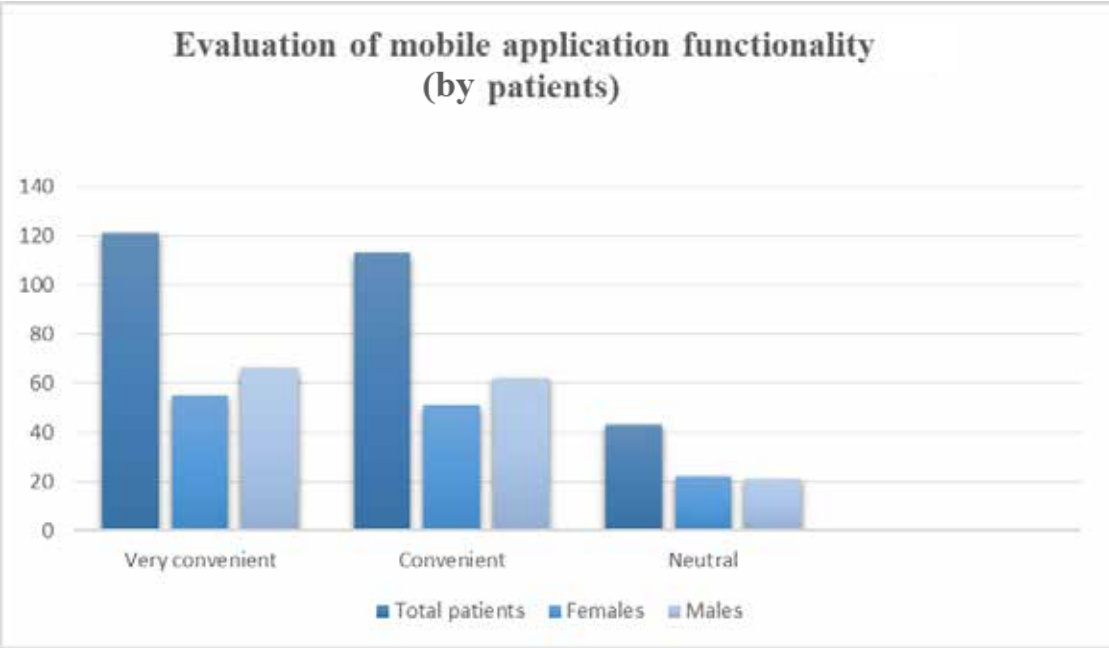

Fig. 5. Evaluation of mobile application functionality (by patients)

and 10 occupational therapists identified an insufficient number of functions. 5 physical therapists, 2 physical medicine and rehabilitation physicians, and 6 occupational therapists consider the applications difficult to use. These results indicate the need for further improvement of mobile technologies to eliminate technical shortcomings and increase functionality. This indicates the need for further improvement of technologies to eliminate technical shortcomings and increase functionality.

In general, the majority of specialists, including 34 physical therapists, 11 physical medicine and rehabilitation physicians, and 26 occupational therapists, would recommend the use of mobile applications in rehabilitation to other specialists, which confirms the high appreciation of mobile technologies among medical workers and their readiness. Accordingly, the results of the study showed that mobile applications are an important tool in rehabilitation medicine, which contributes to improving the quality of medical services, increasing the effectiveness of rehabilitation and ensuring the availability of rehabilitation programs for a wide range of patients. The use of mobile technologies in rehabilitation helps to provide a personal approach and increase convenience for both patients and medical workers.

Prospects for further research

Mobile applications in rehabilitation medicine have significant potential for further development and improvement. Further development of mobile applications may include integration with medical devices and sensors that allow for more accurate and continuous monitoring of patients' health. To improve the effectiveness of rehabilitation, new features such as virtual reality (VR) and augmented reality (AR) can be added, allowing patients to perform rehabilitation exercises in virtual environments. This can contribute to greater patient engagement and increased motivation to complete rehabilitation programs. The use of artificial intelligence (AI) and machine learning (ML) allows for more personalized rehabilitation programs that take into account individual patient characteristics, their needs, and responses to treatment. This ensures a more efficient and faster update process. To further use mobile applications in rehabilitation medicine, it is important to expand their availability in different regions and countries. Since mobile applications collect and process patient medical data, it is important to ensure their security and privacy. Further development in this direction may include the implementation of new security standards and data encryption to protect patients' personal information. Integration of mobile applications with electronic medical records allows health workers to get a complete picture of the health status of patients and quickly respond to changes in their condition, which contributes to greater efficiency and accuracy in the provision of medical care. Thus, the prospects for the development of mobile applications in rehabilitation medicine are very broad. They help improve the quality of medical services, improve rehabilitation results and ensure greater accessibility and convenience for patients. The use of modern technologies such as artificial intelligence, virtual and augmented reality, as well as integration with medical devices makes the rehabilitation process even more efficient and innovative.

Conclusions

The results of the study show that mobile applications in rehabilitation medicine significantly improve the efficiency and convenience of the rehabilitation process.

The responses of specialists showed that most of them evaluate mobile technologies positively, considering them effective and functional. The main benefits of using mobile applications include patient accessibility, personalized approach and constant monitoring of health status. Ease of use was also highly rated by both patients and healthcare professionals.

Patients noted significant improvements in health status, pain relief and increased quality of life due to the use of mobile applications. Interactive features and reminders helped patients to actively engage in the rehabilitation process and adhere to recommended programs. Specialists also emphasized the importance of constant feedback from patients, which is provided by mobile technologies.

However, some disadvantages were noted, such as technical problems and insufficient number of functions in some applications. This indicates the need for further improvement of mobile technologies to eliminate technical shortcomings and increase functionality. Despite this, most specialists recommend the use of mobile applications in rehabilitation to other healthcare professionals, which emphasizes their high assessment and willingness to integrate these technologies into standard medical practice. Thus, mobile applications are an important tool in rehabilitation medicine, which helps improve the quality of medical services, increase the effectiveness of rehabilitation and ensure the availability of rehabilitation programs for a wide range of patients. The use of mobile technologies allows for a personalized approach, constant monitoring of health status and ease of use, which makes the rehabilitation process more effective and comfortable for both patients and healthcare professionals.

Bibliography

1. Özden F. The effect of mobile application-based rehabilitation in patients with Parkinson's disease: a systematic review and meta-analysis. Clin Neurol Neurosurg [Інтернет]. Груд. 2022 [цитовано 15 лип. 2025]:107579. https://doi.org/10.1016/j.clineuro.2022.107579

2. Finkelstein J, Huo X, Parvanova I, Galsky M. Studies in Health Technology and Informatics [Інтернет]. [місце невідоме]: IOS Press; 2022. Usability Inspection of a Mobile Cancer Telerehabilitation System; [цитовано 15 лип. 2025]. https://doi.org/10.3233/shti210944

3. Lozano-Lozano M, Martín-Martín L, Galiano-Castillo N, Fernández-Lao C, Cantarero-Villanueva I, López-Barajas IB, Arroyo-Morales M. Mobile health and supervised rehabilitation versus mobile health alone in breast cancer survivors: Randomized controlled trial. Ann Phys Rehabil Med [Інтернет]. Лип. 2020 [цитовано 15 лип. 2025];63(4):316–24. https://doi.org/10.1016/j.rehab.2019.07.007

4. Park HY, Nam KE, Lim JY, Yeo SM, Lee JI, Hwang JH. Real-Time Interactive Digital Health Care System for Postoperative Breast Cancer Patients: A Randomized Controlled Trial. Telemed E [Інтернет]. 29 листоп. 2022 [цитовано 15 лип. 2025]. https://doi.org/10.1089/tmj.2022.0360

5. Filakova K, Janikova A, Felsoci M, Dosbaba F, Su JJ, Pepera G, Batalik L. Home-based cardio-oncology rehabilitation using a telerehabilitation platform in hematological cancer survivors: a feasibility study. BMC Sports Sci Med Rehabil [Інтернет]. 23 берез. 2023 [цитовано 15 лип. 2025];15(1). https://doi.org/10.1186/s13102-023-00650-2

6. Phuphanich ME, Sinha KR, Truong M, Pham QG. Telemedicine for Musculoskeletal Rehabilitation and Orthopedic Postoperative Rehabilitation. Phys Med Rehabil Clin N Am [Інтернет]. Трав. 2021 [цитовано 15 лип. 2025];32(2):319-53. https://doi.org/10.1016/j.pmr.2020.12.004

7. Aubert T, Auberger G, Gerard P, Lhotellier L, Marmor S, Graff W. Risk factors associated with femorotomy or fracture during cementless stem removal and generation of an individual predictive risk score. J Arthroplast [Інтернет]. Верес. 2022 [цитовано 15 лип. 2025]. https://doi.org/10.1016/j.arth.2022.09.012

8. Clark RA, Conway A, Poulsen V, Keech W, Tirimacco R, Tideman P. Alternative models of cardiac rehabilitation: A systematic review. Eur J Prev Cardiol [Інтернет]. 13 серп. 2013 [цитовано 15 лип. 2025];22(1):35–74. https://doi.org/10.1177/2047487313501093

9. Guthrie MD, Gilbert DL, Huddleston DA, Pedapati EV, Horn PS, Mostofsky SH, Wu SW. Online Transcranial Magnetic Stimulation Protocol for Measuring Cortical Physiology Associated with Response Inhibition. J Vis Exp [Інтернет]. 8 лют. 2018 [цитовано 15 лип. 2025];132. https://doi.org/10.3791/56789

10. Nikolaev VA, Nikolaev AA. Recent trends in telerehabilitation of stroke patients: A narrative review. NeuroRehabilitation [Інтернет]. 6 трав. 2022 [цитовано 15 лип. 2025]:1–22. https://doi.org/10.3233/nre-210330

11.Peretti A, Amenta F, Tayebati SK, Nittari G, Mahdi SS. Telerehabilitation: Review of the State-of-the-Art and Areas of Application. JMIR Rehabil Assist Technol [Інтернет]. 21 лип. 2017 [цитовано 15 лип. 2025];4(2): e7. https://doi.org/10.2196/rehab.7511

12. Piotrowicz E, Pencina MJ, Opolski G, Zareba W, Banach M, Kowalik I, Orzechowski P, Szalewska D, Pluta S, Glówczynska R, Irzmanski R, Oreziak A, Kalarus Z, Lewicka E, Cacko A, Mierzynska A, Piotrowicz R. Effects of a 9-Week Hybrid Comprehensive Telerehabilitation Program on Long-term Outcomes in Patients With Heart Failure. JAMA Cardiol [Інтернет]. 1 берез. 2020 [цитовано 15 лип. 2025];5(3):300. https://doi.org/10.1001/jamacardio.2019.5006

13. Piotrowicz E, Piotrowicz R. Cardiac telerehabilitation: current situation and future challenges. Eur J Prev Cardiol [Інтернет]. 23 трав. 2013 [цитовано 15 лип. 2025];20(2_suppl):12–6. https://doi.org/10.1177/2047487313487483c

14. Piotrowicz E, Zieliński T, Bodalski R, Rywik T, Dobraszkiewicz-Wasilewska B, Sobieszczańska-Małek M, Stepnowska M, Przybylski A, Browarek A, Szumowski Ł, Piotrowski W, Piotrowicz R. Home-based telemonitored Nordic walking training is well accepted, safe, effective and has high adherence among heart failure patients, including those with cardiovascular implantable electronic devices: a randomised controlled study. Eur J Prev Cardiol [Інтернет]. 26 верес. 2014 [цитовано 15 лип. 2025];22(11):1368–77. https://doi.org/10.1177/2047487314551537

15. Tchero H, Tabue Teguo M, Lannuzel A, Rusch E. Telerehabilitation for Stroke Survivors: Systematic Review and Meta-Analysis. J Med Internet Res [Інтернет]. 26 жовт. 2018 [цитовано 15 лип. 2025];20(10):e10867. https://doi.org/10.2196/10867

16. Toh SH, Lee SC, Sündermann O. Behavioral Health Coaching as a Preventive Workplace Intervention: Retrospective Longitudinal Study (Preprint). JMIR Form Res [Інтернет]. 12 січ. 2023 [цитовано 15 лип. 2025]. https://doi.org/10.2196/45678

17. Truijen S, Abdullahi A, Bijsterbosch D, van Zoest E, Conijn M, Wang Y, Struyf N, Saeys W. Effect of home-based virtual reality training and telerehabilitation on balance in individuals with Parkinson disease, multiple sclerosis, and stroke: a systematic review and meta-analysis. Neurol Sci [Інтернет]. 17 лют. 2022 [цитовано 15 лип. 2025];43(5):2995–3006. https://doi.org/10.1007/s10072-021-05855-2

18. Horoshko VI, Horoshko A. Analysis of the data obtained during the experiment, assessment of objective symptoms to identify chronic visual fatigue. Rehabilitation amp recreation [Інтернет]. 26 квіт. 2022 [цитовано 15 лип. 2025];(10):24–30. https://doi.org/10.32782/2522-1795.2022.10.3

References

1. Özden F. The effect of mobile application-based rehabilitation in patients with Parkinson's disease: a systematic review and meta-analysis. Clin Neurol Neurosurg [Інтернет]. Груд. 2022 [цитовано 15 лип. 2025]:107579. https://doi.org/10.1016/j.clineuro.2022.107579

2. Finkelstein J, Huo X, Parvanova I, Galsky M. Studies in Health Technology and Informatics [Інтернет]. [місце невідоме]: IOS Press; 2022. Usability Inspection of a Mobile Cancer Telerehabilitation System; [цитовано 15 лип. 2025]. https://doi.org/10.3233/shti210944

3. Lozano-Lozano M, Martín-Martín L, Galiano-Castillo N, Fernández-Lao C, Cantarero-Villanueva I, López-Barajas IB, Arroyo-Morales M. Mobile health and supervised rehabilitation versus mobile health alone in breast cancer survivors: Randomized controlled trial. Ann Phys Rehabil Med [Інтернет]. Лип. 2020 [цитовано 15 лип. 2025];63(4):316–24. https://doi.org/10.1016/j.rehab.2019.07.007

4. Park HY, Nam KE, Lim JY, Yeo SM, Lee JI, Hwang JH. Real-Time Interactive Digital Health Care System for Postoperative Breast Cancer Patients: A Randomized Controlled Trial. Telemed E [Інтернет]. 29 листоп. 2022 [цитовано 15 лип. 2025]. https://doi.org/10.1089/tmj.2022.0360

5. Filakova K, Janikova A, Felsoci M, Dosbaba F, Su JJ, Pepera G, Batalik L. Home-based cardio-oncology rehabilitation using a telerehabilitation platform in hematological cancer survivors: a feasibility study. BMC Sports Sci Med Rehabil [Інтернет]. 23 берез. 2023 [цитовано 15 лип. 2025];15(1). https://doi.org/10.1186/s13102-023-00650-2

6. Phuphanich ME, Sinha KR, Truong M, Pham QG. Telemedicine for Musculoskeletal Rehabilitation and Orthopedic Postoperative Rehabilitation. Phys Med Rehabil Clin N Am [Інтернет]. Трав. 2021 [цитовано 15 лип. 2025];32(2):319–53. https://doi.org/10.1016/j.pmr.2020.12.004

7. Aubert T, Auberger G, Gerard P, Lhotellier L, Marmor S, Graff W. Risk factors associated with femorotomy or fracture during cementless stem removal and generation of an individual predictive risk score. J Arthroplast [Інтернет]. Верес. 2022 [цитовано 15 лип. 2025]. https://doi.org/10.1016/j.arth.2022.09.012

8. Clark RA, Conway A, Poulsen V, Keech W, Tirimacco R, Tideman P. Alternative models of cardiac rehabilitation: A systematic review. Eur J Prev Cardiol [Інтернет]. 13 серп. 2013 [цитовано 15 лип. 2025];22(1):35–74. https://doi.org/10.1177/2047487313501093

9. Guthrie MD, Gilbert DL, Huddleston DA, Pedapati EV, Horn PS, Mostofsky SH, Wu SW. Online Transcranial Magnetic Stimulation Protocol for Measuring Cortical Physiology Associated with Response Inhibition. J Vis Exp [Інтернет]. 8 лют. 2018 [цитовано 15 лип. 2025];(132). https://doi.org/10.3791/56789

10. Nikolaev VA, Nikolaev AA. Recent trends in telerehabilitation of stroke patients: A narrative review. NeuroRehabilitation [Інтернет]. 6 трав. 2022 [цитовано 15 лип. 2025]:1–22. https://doi.org/10.3233/nre-210330

11.Peretti A, Amenta F, Tayebati SK, Nittari G, Mahdi SS. Telerehabilitation: Review of the State-of-the-Art and Areas of Application. JMIR Rehabil Assist Technol [Інтернет]. 21 лип. 2017 [цитовано 15 лип. 2025];4(2): e7. https://doi.org/10.2196/rehab.7511

12. Piotrowicz E, Pencina MJ, Opolski G, Zareba W, Banach M, Kowalik I, Orzechowski P, Szalewska D, Pluta S, Głowczynska R, Irzmanski R, Oreziak A, Kalarus Z, Lewicka E, Cacko A, Mierzynska A, Piotrowicz R. Effects of a 9-Week Hybrid Comprehensive Telerehabilitation Program on Long-term Outcomes in Patients With Heart Failure. JAMA Cardiol [Інтернет]. 1 берез. 2020 [цитовано 15 лип. 2025];5(3):300. https://doi.org/10.1001/jamacardio.2019.5006

13. Piotrowicz E, Piotrowicz R. Cardiac telerehabilitation: current situation and future challenges. Eur J Prev Cardiol [Інтернет]. 23 трав. 2013 [цитовано 15 лип. 2025];20(2_suppl):12–6. https://doi.org/10.1177/2047487313487483c

14. Piotrowicz E, Zieliński T, Bodalski R, Rywik T, Dobraszkiewicz-Wasilewska B, Sobieszczańska-Małek M, Stepnowska M, Przybylski A, Browarek A, Szumowski Ł, Piotrowski W, Piotrowicz R. Home-based telemonitored Nordic walking training is well accepted, safe, effective and has high adherence among heart failure patients, including those with cardiovascular implantable electronic devices: a randomised controlled study. Eur J Prev Cardiol [Інтернет]. 26 верес. 2014 [цитовано 15 лип. 2025];22(11):1368–77. https://doi.org/10.1177/2047487314551537

15. Tchero H, Tabue Teguo M, Lannuzel A, Rusch E. Telerehabilitation for Stroke Survivors: Systematic Review and Meta-Analysis. J Med Internet Res [Інтернет]. 26 жовт. 2018 [цитовано 15 лип. 2025];20(10):e10867. https://doi.org/10.2196/10867

16. Toh SH, Lee SC, Sündermann O. Behavioral Health Coaching as a Preventive Workplace Intervention: Retrospective Longitudinal Study (Preprint). JMIR Form Res [Інтернет]. 12 січ. 2023 [цитовано 15 лип. 2025]. https://doi.org/10.2196/45678

17. Truijen S, Abdullahi A, Bijsterbosch D, van Zoest E, Conijn M, Wang Y, Struyf N, Saeys W. Effect of home-based virtual reality training and telerehabilitation on balance in individuals with Parkinson disease, multiple sclerosis, and stroke: a systematic review and meta-analysis. Neurol Sci [Інтернет]. 17 лют. 2022 [цитовано 15 лип. 2025];43(5):2995–3006. https://doi.org/10.1007/s10072-021-05855-2

18. Horoshko VI, Horoshko A. Analysis of the data obtained during the experiment, assessment of objective symptoms to identify chronic visual fatigue. Rehabilitation amp recreation [Інтернет]. 26 квіт. 2022 [цитовано 15 лип. 2025];(10):24–30. https://doi.org/10.32782/2522-1795.2022.10.3

The purpose of the article is to assess the effectiveness and reasonability of using mobile applications as a tool for personalized rehabilitation.

Materials and methods. This study used a systematic literature review method. The search for scientific sources was carried out in databases such as PubMed, Scopus and Google Scholar. The selection of articles was carried out according to the following criteria: publication in peer-reviewed journals, articles in English, studies conducted in the last ten years (2014–2024). A structured questionnaire method was used to survey physical and rehabilitation medicine doctors, physical therapists and occupational therapists. The selected free mobile applications were tested in clinical settings with the involvement of patients of different ages (from 18 to 68 years, 128 women, 149 men) and with different pathologies. Patients used PhysiApp, RehabCoach and Kaia Health in their daily rehabilitation practice. The effectiveness of the applications was assessed based on data on patient improvement, rehabilitation duration and user satisfaction.

Results. Overall, the majority of specialists, including 34 physical therapists, 11 Doctor of Physical and rehabilitation medicine, and 26 occupational therapists, would recommend the use of mobile applications in rehabilitation to other specialists, which confirms the high appreciation of mobile technologies among healthcare professionals and their readiness to integrate such tools into their practice.

Conclusions. The results of the study demonstrate that mobile applications in rehabilitation medicine significantly increase the efficiency and convenience of the rehabilitation process. The responses of specialists showed that most of them positively evaluate mobile technologies, considering them effective and functional. The main benefits of using mobile applications include accessibility for patients, a personalized approach and constant monitoring of health status. Ease of use was also highly rated by both patients and medical professionals.

Key words: mobile applications, rehabilitation, physical therapist, occupational therapist, Doctor of Physical and rehabilitation medicine.

Мета: оцінка ефективності та доцільності використання мобільних додатків як інструменту для персоналізованої реабілітації пацієнтів/клієнтів із різними патологіями. Ураховуючи активний розвиток цифрових технологій у сфері охорони здоров'я, актуальним постає питання інтеграції мобільних рішень у клінічну практику фізичної терапії та ерготерапії. У дослідженні розглядаються потенціал і різні функціональні рішення мобільних додатків для поліпшення загального функціонального стану пацієнтів/клієнтів, оптимізації реабілітаційних утручань та підвищення якості обслуговування пацієнтів/клієнтів.

Матеріали та методи. Методологічною основою слугував систематичний огляд наукової літератури за період 2014–2024 рр. із використанням баз даних PubMed, Scopus та Google Scholar. Критеріями включення були: публікації у рецензованих журналах, англомовні статті, дослідження з клінічним фокусом на застосування мобільних технологій у реабілітації та відновній медицині. Емпіричний компонент дослідження реалізовано через структуроване анкетування серед фахівців галузі реабілітації – фізичних терапевтів (n = 34), лікарів фізичної та реабілітаційної медицини (n = 11) та ерготерапевтів (n = 26). Анкетування охоплювало оцінку ставлення до цифрових інструментів і мобільних пристроїв, готовності до їх упровадження та практичного досвіду використання у клінічній практиці.

Клінічне тестування охоплювало три мобільні додатки: PhysiApp, RehabCoach та Kaia Health, які були вибрані за критерієм доступності для всіх категорій населення України (безкоштовність) та адаптивності до потреб пацієнтів/клієнтів. Участь у випробуванні взяли 277 пацієнтів/клієнтів (128 жінок, 149 чоловіків) віком від 18 до 68 років. Гендерна рівність збережена. Пацієнти/клієнти застосовували мобільні додатки в межах щоденної реабілітаційної практики у процесі відновлення згідно з індивідуальним реабілітаційним планом кожного пацієнта/клієнта, а дані про динаміку стану, тривалість лікування та задоволеність користувачів були систематизовані та проаналізовані безпосередньо після збору усієї статистичної інформації.

Результати дослідження свідчать про значне поліпшення функціонального стану пацієнтів/клієнтів, скорочення тривалості реабілітаційного циклу та високий рівень користувацької задоволеності. Понад 85% лікарів фізичної і реабілітаційної медицини, фізичних терапевтів, ерготерапевтів, що взяли участь в опитуванні, рекомендували застосування цифрових рішень у щоденній практиці та мали позитивний власний досвід такого використання у роботі з пацієнтами/клієнтами. Серед ключових переваг мобільних додатків визначено: персоналізований підхід до пацієнта, доступність програм у будь-який час, можливість дистанційного моніторингу та забезпечення постійного зворотного зв'язку. Пацієнти особливо позитивно оцінили інтерфейс додатків, індивідуалізацію тренувальних програм, а також мотиваційний ефект у процесі реабілітації.

На підставі отриманих даних установлено, що мобільні додатки можуть слугувати ефективним інструментом для підтримки реабілітаційного процесу, особливо в умовах обмеженого доступу до очних медичних послуг або за потреби в автономному дотриманні програми. Упровадження мобільних технологій у практику реабілітаційної медицини відповідає принципам доказової медицини, сприяє оптимізації реабілітаційних маршрутів та забезпечує індивідуалізований підхід до втручань. У підсумку дослідження підтверджує доцільність системної інтеграції мобільних додатків у реабілітаційну медицину як засобу підвищення ефективності, доступності та якості надання допомоги пацієнтам/клієнтам. Подальші дослідження можуть бути спрямовані на розширення спектру індикаторів ефективності, розвиток методів цифрового моніторингу та розроблення рекомендацій щодо стандартизації використання мобільних додатків у реабілітаційних практиках, підбір та розроблення нових мобільних додатків відповідно до нозологій, а також затверджена панель мобільних додатків, які будуть використовуватися в Україні.

Висновки. Результати дослідження демонструють, що мобільні додатки в реабілітаційній медицині значно підвищують ефективність та зручність процесу реабілітації. Основними перевагами використання мобільних додатків є доступність для

пацієнтів/клієнтів, персоналізований підхід та постійний моніторинг стану здоров'я і самостійне відстежування стану здоров'я самим пацієнтом/клієнтом, тобто безпосереднє залучення його до реабілітаційного процесу на всіх етапах реабілітації.

Ключові слова: мобільні додатки, реабілітація, фізичний терапевт, ерготерапевт, лікар фізичної та реабілітаційної медицини.

Conflict of interest: absent.
Конфлікт інтересів: відсутній.

Information about the authors

Horoshko Viktoriia Ivanivna – Candidate of Medical Sciences, Associate Professor, Educational and Scientific Institute of Health Care, National University of Water and Environmental Engineering; Soborna Str., 11, Rivne, Ukraine, 33028.
talgardat@gmail.com, ORCID ID: 0000-0002-5244-5648 [A,B,E,F]

Horoshko Andrii Ihorovych – Postgraduate Student, Technische Universität Graz, the Doctoral School of Biomedical Engineering at the Faculty of Computer Science and Biomedical Engineering at Graz University of Technology; Rechbauerstraße, 12, Graz, Austria 8010.
andrii.horoshko@student.tugraz.at, ORCID ID: 0009-0008-9956-4135 [B,C,D]

Стаття надійшла до редакції 22.07.2025
Дата першого рішення 11.09.2025
Стаття подана до друку 30.09.2025