

Analysis of the effectiveness of the developed system of physical therapy for patients with rheumatoid arthritis in terms of daily activity, health status and quality of life

Anzhela Nogas^a, Igor Grygus^a, Serhii Hutsman^a, Valerii Diachuk^a, Ivanna Blayda^b

^aInstitute of Health Care, National University of Water and Environmental Engineering, Rivne, Ukraine

^bDepartment of Rehabilitation and Human Health, Stepan Gzhytskyi National University of Veterinary Medicine and Biotechnologies of L'viv, L'viv, Ukraine

DOI: [https://doi.org/10.15391/prrht.2024-9\(2\).07](https://doi.org/10.15391/prrht.2024-9(2).07)

Received: 19.03.2024

Accepted: 25.03.2024

Published: 30.03.2024

Citation:

Nogas, A., Grygus, I., Hutsman, S., Diachuk, V., & Blayda, I. (2024). Analysis of the effectiveness of the developed system of physical therapy for patients with rheumatoid arthritis in terms of daily activity, health status and quality of life. *Physical rehabilitation and recreational health technologies*, 9(2), 90-97. [https://doi.org/10.15391/prrht.2024-9\(2\).07](https://doi.org/10.15391/prrht.2024-9(2).07)

Corresponding author:

Igor Grygus

Institute of Health Care, National University of Water and Environmental Engineering, Rivne, Ukraine
<https://orcid.org/0000-0003-2856-8514>
e-mail: grigus03@gmail.com

Anzhela Nogas

<https://orcid.org/0000-0003-1287-9828>

Serhii Hutsman

<https://orcid.org/0000-0002-1817-6835>

Valerii Diachuk

<https://orcid.org/0009-0006-6502-1787>

Ivanna Blayda

<https://orcid.org/0009-0000-7302-102X>

Abstract

Purpose. The purpose of the article is to analyze the effectiveness of the developed system of physical therapy for patients with rheumatoid arthritis based on the results of indicators of daily activity, health status and quality of life.

Material & Methods. 188 patients with rheumatoid arthritis were examined, including 156 women (83%) and 32 men (17%), with an average age of $44,9 \pm 7,6$ years. The patients were randomly divided into a control group ($n=92$) and a study group ($n=96$). Patients in the main group were trained according to the proposed system of physical therapy, which was developed in accordance with the domains of the ICF, taking into account factors affecting the level of functional impairment, health status and quality of life (categories at the level of activity and participation). In the dynamics, a comparative assessment of functional limitations in the daily activity of the upper extremities was performed using the DASH questionnaire, health status assessment using the Stanford Health Interview, and quality of life using the EuroQol-5D-5L questionnaire.

Results. In patients with rheumatoid arthritis, the initial examination revealed impaired performance of daily activities, in particular, activities requiring hand strength according to the DASH questionnaire, low self-assessment of health according to the Stanford Health Assessment Questionnaire, and significant deterioration in quality of life (EQ-5D-5L) due to the negative impact of existing functional impairments of the upper extremities. After the rehabilitation intervention, patients in both groups showed statistically significant improvement in all studied indicators: facilitation of performing household activities in everyday life, increased self-assessment of health, and improved quality of life compared to baseline data ($p < 0.05$). However, patients in the main group showed a significantly better result than patients in the control group, which indicates the effectiveness of the proposed rehabilitation measures ($p < 0.05$).

Conclusion. Significantly better differences between patients of the main and control groups were found according to the results of the studied indicators, which clearly demonstrates and confirms the effectiveness of the proposed system of physical therapy in contrast to the standard rehabilitation system.

Keywords: rheumatoid arthritis, physical therapy, system, daily activity, health status, quality of life.



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Introduction

Rheumatoid arthritis is an autoimmune connective tissue disease in which the immune system attacks the joints, causing inflammation and damage to the cartilage tissue. The disease most often affects small joints of the upper and lower extremities, less often large joints. Without timely treatment, rheumatoid arthritis leads to deformation

and then destruction of the affected joint, loss of ability to work and disability (Babak et al., 2021; Boers, 2021; Grygus et al., 2023).

In developed countries, recent research suggests that approximately 1,71 billion people worldwide suffer from musculoskeletal diseases. In particular, rheumatoid arthritis affects more than 14 million people (Cieza et al., 2020; Nogas et al., 2022). Women get sick three times more than men. The disease manifests itself between the ages of 30 and 50, that is, in people of the most working age (Kononenko et al., 2022; Bogdanovska et al., 2023).

Until now, researchers have not established the exact causes that contribute to the development of rheumatoid arthritis. However, scientific research indicates the possibility of negative influence of various genetic, environmental and other factors (Korytko et al., 2023; Nogas, 2023).

The presented clinical data indicate that an early and permanent sign of rheumatoid arthritis is progressive muscle atrophy, which leads to a sharp loss of strength, muscle weakness and is accompanied by a significant decrease in the patient's daily activity (Grygus et al., 2023; Bogdanovska et al., 2023).

According to most clinicians, with rheumatoid arthritis there is severe pain in the joints and a lack of control over it, which entails the patient's dissatisfaction with his limited capacity and negatively affects his psychological well-being, self-esteem and adaptation to the disease (Babak et al., 2021; Boers, 2021; Studenic et al., 2023). High levels of anxiety/depression have been shown to be associated with pain, fatigue, and low perceptions (Grygus et al., 2023; Nogas, 2023). Accordingly, patients with rheumatoid arthritis, having low self-esteem, feel less independent and adjusted and rate their health and quality of life as significantly worse (Nekhanevych et al., 2023; Nogas, 2023; Sytnyk, 2023).

Considering the multifactorial influence on various aspects of the quality of life of patients, the need for a comprehensive assessment of this indicator in rheumatoid arthritis becomes more obvious (Korytko et al., 2023; Bogdanovska et al., 2023; Nogas, 2023). Controlled restorative treatment of rheumatoid arthritis will help improve its consequences and maintain the health and quality of life of patients (Grygus et al., 2020; Kononenko et al., 2022; Nogas et al., 2022, 2023).

The lack of physical therapy programs taking into account aspects of quality of life, such as the patient's self-assessment of his health, his emotional, mental and social state in everyday life, determined the relevance of the development of the presented physical therapy system.

Purpose of the study is to analyze the effectiveness of the developed system of physical therapy for patients with rheumatoid arthritis based on the results of indicators of daily activity, health status

and quality of life.

Material and methods of research

Participants

The studies were carried out on the basis of the rheumatology department and the department of rehabilitation treatment using traditional and non-traditional methods of the Municipal Enterprise "Rivne Regional Clinical Hospital named after Yuri Semenyuk". The criteria for inclusion in the study were the presence of an established diagnosis of rheumatoid arthritis based on the 2010 ACR/EULAR criteria (Studenic et al., 2023), and in accordance with the Order of the Ministry of Health of Ukraine dated April 11, 2014 No. 263 "Unified clinical protocol for primary, secondary, tertiary medical care and medical rehabilitation of patients with rheumatoid arthritis" (Order, 2014). Exclusion criteria from the study: age over 60 years, IV radiographic stage of joint damage, third degree of inflammatory process activity, acute inflammatory pain, patient refusal to participate in the study.

We examined 188 patients with rheumatoid arthritis, of which 156 (83%) were women, 32 (17%) were men, whose average age was $44,9 \pm 7,6$ years. Using the randomization method, patients were divided into a control group ($n=92$), of which 16 (17,4%) were men, 76 (82,6%) women, and the main group ($n=96$), of which 16 were men (16,7%), women – 80 (83,3%).

Study design

The accumulation of study results was carried out as patients were admitted to hospital treatment. Patients in the control group (CG) underwent rehabilitation in accordance with the recommendations of the attending physician and the regulatory document of the Ministry of Health of Ukraine (Order, 2014), taking into account the principles recommended for use at the inpatient stage of treatment. Patients of the main group (MG) were engaged in the proposed system of physical therapy, developed in accordance with the domains of the International Classification of Functioning (ICF) (MKF, 2018), taking into account factors affecting the level of functional impairment, health status and quality of life. The physical therapy program was developed for a long period of 6 months, with a personalized approach to each patient. The program of rehabilitation measures included: therapeutic exercises based on the period of the disease and functional insufficiency of the joint (treatment by position, static, passive and active exercises with assistance, without assistance, with resistance); exercises with objects; special exercises to improve range of motion in affected joints and muscle strength. Passive and active movements of the fingers "bending into a fist" within the pain threshold, active flexion-extension in the wrist joint, special exercises for the hand, exercises using wrist simulators, active movements in the elbow and shoulder joints are recommended.

Therapeutic massage was used and the patient was trained in self-massage, physiotherapeutic procedures, hydrotherapy, orthotics, kinesiotaping of the upper limbs, mechanotherapy and psychological support.

Hydrotherapy was used to improve circulation, reduce joint pain and muscle spasm. The mechanotherapy technique was differentiated depending on the characteristics of the clinical forms of joint damage to improve the range of motion, stretching and improving the elasticity of muscles and ligaments, restoring muscle strength and motor function of the joints of the upper extremities.

In the complex treatment of patients with rheumatoid arthritis, autogenic training and positive psychotherapy were used, based on a positive approach to the patient and the disease and self-help (Grygus et al, 2020; Nogas, 2023). During the rehabilitation process, short- and long-term goals were determined in the "SMART" format, individual for each patient.

To analyze the effectiveness of the developed system of physical therapy for patients with rheumatoid arthritis, a comparative assessment of functional limitations in daily activity of the arm and hand was carried out using the main section of the DASH questionnaire (Disability of the Arm, Shoulder and Hand Outcome Measure) (Jester, 2005), to assess the health status of patients – the Stanford Health Assessment Questionnaire (Sytnyk, 2023), quality of life – according to the EuroQol-5D-5L questionnaire, consisting of two parts: the first part – EQ-5Q profile, the second part – visual analog EQ VAS scale (EQ Visual Analogue Scale). The results of patient responses were processed and presented in accordance with EuroQol Group recommendations (EQ-5D <https://euroqol.org/>).

The study was conducted in compliance with the basic provisions of the "Rules of ethical principles for conducting scientific medical research involving humans", approved by the Declaration of Helsinki (1964-2013), ICH GCP (1996), EEC Directive No. 609 (dated November 24, 1989), orders Ministry of Health of Ukraine No. 690 of September 23, 2009, No. 944 of December 14, 2009, No. 616 of August 3, 2012. Patients participated in the study entirely at their own request, which is confirmed by personally signed appropriate informed consent.

Statistical analysis

The statistical description of the samples was car-

ried out by determining the arithmetic mean (M) and standard deviation (SD). The type of distribution of parameters in the variation series was determined using the Shapiro-Wilk criterion. The significance of differences between samples was assessed using nonparametric methods for dependent and independent samples (Wilcoxon T-test, Mann-Whitney U-test). The criterion for the reliability of the estimates was the level of significance indicating the probability of an erroneous estimate (p). The difference in means was considered significant at $p < 0.05$. The resulting digital material was processed statistically using the statistical analysis package Statistica 10 (Serial Number: STA999K347150-W).

Results of the study

As a result of inflammation in the upper extremities (arms and hands), patients with rheumatoid arthritis experience limited mobility and decreased muscle strength when performing activities of daily life. In particular, patients experienced the greatest difficulties when performing actions that required hand strength: opening a tightly closed jar; carry a heavy object weighing more than 4.5 kg; open the heavy door. Women (57.6%) with significant complications found it difficult to do household chores (washing walls, floors, etc.), prepare food, and take care of the garden or yard. Men (17.1%) had complaints about performing actions or activities that required effort: working with a hammer, sweeping, moving things from one place to another. At the same time, 12.7% of patients had difficulty performing movements associated with raising the upper limb (putting an object on a shelf above your head, replacing a light bulb above your head, washing or drying your hair, washing your back, etc.). This was shown by low scores on the DASH questionnaire (Table 1).

Thus, at the beginning of the study, based on the results of the DASH questionnaire, we found that patients in both groups did not have an excellent result (up to 25 points), only 5.2% of people in the main group and 5.4% of patients in the control group noted a good result (26-50 points). A satisfactory result was found in 39.5% of patients in the main group and in 42.4% of the control group, respectively, an unsatisfactory result was found in 55.3% and 52.2% of patients (Table 1).

Repeated examination of patients after 3 months showed positive changes in the functional ability

Table 1. Dynamics of indicators on the DASH questionnaire in patients with rheumatoid arthritis at the beginning of the study and 3 months after the course of physical therapy (%)

Evaluation of the result (points)	At the beginning of the study (%)		3 months after the physical therapy course (%)	
	MG (n=96)	CG (n=92)	MG (n=96)	CG (n=92)
Good (26-50)	5,2	5,4	27,1*	17,5
Satisfactory (51-75)	39,5	42,4	52,1*	50,0
Unsatisfactory (76-100)	55,3	52,2	20,8*	32,5

* – $p < 0,05$ between the indicators of the main and control groups

of the arm and hand to perform daily activities and participation according to the dynamics of the average scores of the DASH questionnaire in both groups, however, in patients of the main group, the changes were more pronounced than in patients in the control group, where the indicators were lower (Table 1).

In particular, in the patients of the main group, the number of people who had a good result increased – 27,1%; in the control group, only 17,5% of patients had a good result. There were more patients with a satisfactory result in the main group – 52,1%, than in the control group – 50,0%. The result remained unsatisfactory in 20.8% of patients in the main group and was higher than in the control group – 32,5% of patients (Table 1).

Analysis of the results on the DASH questionnaire after 6 months of physical therapy indicated a significant improvement in patients of the main group, which is shown in Table 2.

Accordingly, a good result in patients of the main group was 25,0% more than in patients in the control group, a satisfactory result exceeded 18,0% of people in the main group, with an unsatisfactory result there were 7,0% fewer patients in the main group according to compared with the control group, demonstrating a better effect of the recommended physical therapy program (Table 2).

To determine the effectiveness of the recommended physical therapy program on assessing the health status of patients with rheumatoid arthritis, we studied the results of the Stanford Health

Assessment Questionnaire (Health Assessment Questionnaire). Thus, the total indicator at the beginning of the study in patients of the main group was $6,5 \pm 9,5$ points, in the control group – $6,3 \pm 0,7$ points, which indicates a low self-esteem of health due to the negative impact of existing functional disorders of the upper limbs (Figure 1) ($p < 0,05$).

3 months after both standard treatment and physical therapy, significantly better changes occurred in patients of the main group – the total score of the Stanford Health Assessment Questionnaire decreased to $3,9 \pm 11,1$ points. In patients in the control group, the total score was worse and amounted to $4,7 \pm 2,3$ points (Figure 1) ($p < 0,05$).

When re-questioning 6 months later, based on the results of answers to questions from the Stanford Health Assessment Questionnaire, the total score in both groups improved, but in the main group it became significantly better and was closer to the normal score – $1,8 \pm 12,2$ points than in patients in the control group – $2,9 \pm 4,1$ points (Figure 1) ($p < 0,05$). The results obtained show the effectiveness of the proposed physical therapy program for each patient.

During the survey conducted at the beginning of the study, using the subscales of the EuroQol-5D-5L questionnaire, a significant deterioration in the quality of life of patients with rheumatoid arthritis in both the main and control groups was revealed. This is due to the progressive chronic course of the disease, which resulted in a deterioration in all aspects of quality of life: decreased physical activity, limited ability to self-care and daily activities, and

Table 2. Dynamics of indicators according to the DASH questionnaire in patients with rheumatoid arthritis 6 months after a course of physical therapy (%)

Evaluation of the result (points)	3 months after the physical therapy course (%)		6 months after the physical therapy course (%)	
	MG (n=96)	MG (n=96)	MG (n=96)	CG (n=92)
Good (26-50)	27,1	27,1	49*	24
Satisfactory (51-75)	52,1	52,1	39,6*	57,6
Unsatisfactory (76-100)	20,8	20,8	11,4*	18,4

* – $p < 0,05$ between the indicators of the main and control groups.

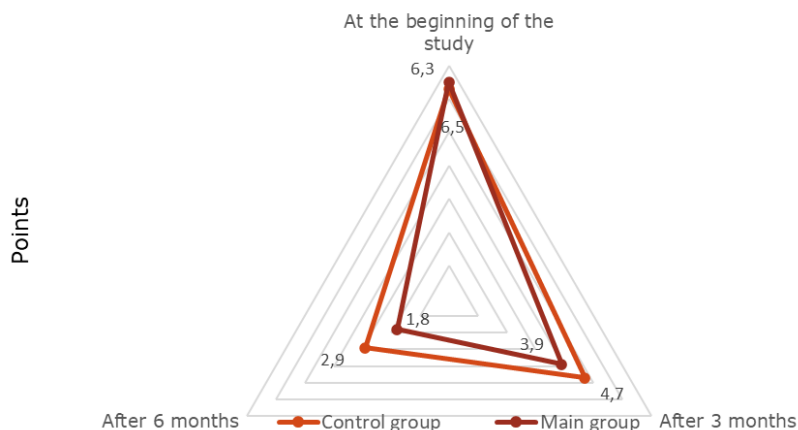


Figure 1. Dynamics of change in the total score of the Stanford Health Assessment Questionnaire in patients with rheumatoid arthritis (points)

impaired mental health. The majority of patients noted the presence of problems in almost all indicators of quality of life, as shown in Table 3.

During the second survey after 3 months, the effective influence of the physical therapy program contributed to significant positive dynamics in the quality of life in all indicators on the subscales of the EuroQol-5D-5L questionnaire (Table 3): "mobility" in the main group at the level of 2-3 points – 45,8 % and noted the indicator at the level of 1 point – 52,1% of respondents. In the control group, the indicator remained at the level of 2-3 points in 58,7% of patients and reached the level of 1 point in 38,1% of people. In the "self-care" section, in the patients of the main group the indicator at the level of 3-4 points was 15,0% less in contrast to the control group; at the level of 1-2 points the number of respondents was higher in the main group by 14,9% of patients. The indicator of daily activities improved in both groups, however, in patients of the main group it remained at the level of 4 points in 6,2% of people, in the control group – in 7,6% of people. After 3 months, 43,8% of respondents in the main group noted the absence of "pain/discomfort," while in the control group only 39,2% of people noted the absence of pain. In patients of the main group, the percentage with severe and moderate anxiety/depression de-

creased to 31,2%, in the control group to 43,4%; 26,0% and 23,9% of people, respectively, experienced slight anxiety; 42,8% of patients in the main group did not experience any anxiety and did not have depression (1 point), while in the control group the number of such patients was 10,1% less (Table 3).

Accordingly, after 6 months, on the "mobility" scale, the condition of patients in the main group significantly improved and became at the level of 1 point in 76,1% of people, and remained at the level of 2-3 points in 23,9% of people. The indicator of the control group was 65,2% of patients, which is 10,9% less than in the main group; 34,8% of people remained at the level of 2-3 points (Table 4). With minor and moderate problems with self-care (2-3 points), 25% of patients remained in the main group, 35,8% of people remained in the control group, which is 10,8% more than in the main group. The absence of problems with self-care (1 point) was noted by 75,0% of people in the main group; in the control group, the number of patients was less – 64,2% (Table 4). Positive changes occurred in "Normal daily activities", which was reflected at a level of 1 point in 70,8% of patients in the main group, the number of people in the control group at the same level was less – 62,0%. With minor and moderate difficulties in daily ac-

Table 3. Changes in quality of life according to the EuroQol-5D-5L questionnaire in patients with rheumatoid arthritis under the influence of a physical therapy program

Quality of life indicators	Points	At the beginning of the study (%)		3 months after the physical therapy course (%)	
		MG (n=96)	CG (n=92)	MG (n=96)	CG (n=92)
Mobility	1 point	0	0	52,1*	38,1
	2 points	50,0	51,1	25,0*	32,6
	3 points	43,8	43,5	20,8*	26,1
	4 points	6,2	5,4	2,1*	3,2
	5 points	0	0	0	0
Self-care	1 point	0	0	51,0*	39,2
	2 points	35,5	34,8	28,1*	25,0
	3 points	51,0	52,1	14,6*	29,3
	4 points	13,5	13,1	6,2*	6,5
	5 points	0	0	0	0
Normal daily activities	1 point	0	0	41,7*	38,1
	2 points	33,4	32,7	27,1*	23,9
	3 points	52,0	53,2	25,0*	30,4
	4 points	14,6	14,1	6,2*	7,6
	5 points	0	0	0	0
Pain/discomfort	1 point	0	0	43,8*	39,2
	2 points	26,0	25,0	26,0*	21,7
	3 points	58,4	59,8	22,9*	31,5
	4 points	15,6	15,2	7,3*	7,6
	5 points	0	0	0	0
Anxiety/depression	1 point	0	0	42,8*	32,7
	2 points	18,8	17,4	26,0*	23,9
	3 points	51,0	52,2	20,8*	30,4
	4 points	30,2	30,4	10,4*	13,0
	5 points	0	0	0	0

* – $p < 0,05$ between the indicators of the main and control groups.

tivities (2-3 points), 29,2% of patients remained in the main group, 38,0% of people remained in the control group, which is 8,8% more than in the main group. Pain at the level (2-3 points) remained in 26.0% of patients in the main group; in the control group, the number of people at this level was 35.9%. 6 months after completing the course of physical therapy, 74% of patients in the main group noted the absence of pain, while in the control group there were 64,1% of such persons, which is 9,9% less. At the end of the study, no patients in either group felt severely anxious/depressed. In 21,7% of patients in the control group, there was still minor concern, in the main group only 12,5% of people. 82,3% of respondents in the main group noted the absence of anxiety/depression, in the control group – 70,7% of people, which is 11,6% less (Table 4).

According to the EQ-VAS visual analogue scale, the average indicator characterizing the assessment of the health status of patients in the main group was 48 points at the beginning of the study and, under the influence of the completed course of physical therapy, gradually increased to 82,5 points. In patients in the control group, from 54 points, the average health status score as a result of conventional rehabilitation treatment increased to 70 points, which is 12,5 points less than in the main group.

Discussion

The issue of restorative treatment using rehabilitation measures is extremely important for patients with rheumatoid arthritis in order to improve the functional activity of the upper extremities, achieve long-term remission and improve the quality of life (Bogdanovska et al., 2023; Grygus et al., 2023; Nogas et al., 2022; Nogas, 2023).

Today, the constant basis of treatment for patients with rheumatoid arthritis is drug therapy. Treatment of rheumatoid arthritis is symptomatic and aimed at eliminating symptoms and slowing the progression of the disease (Babak et al., 2021; Boers, 2021; Studenic et al., 2023).

It is important to study the functional state and limit the mobility of the affected upper limbs in rheumatoid arthritis to form an individual approach to physical therapy for thematic patients (Nekhanevych et al., 2023; Korytko et al., 2023).

A differentiated strategy for the rehabilitation treatment of patients with rheumatoid arthritis is to develop and implement a comprehensive therapeutic program, including, in addition to conservative therapy, the use of non-drug measures (Bogdanovska et al., 2023; Grygus et al., 2023; Nogas, 2023).

Table 4. Changes in quality of life according to the EuroQol-5D-5L questionnaire in patients with rheumatoid arthritis under the influence of a physical therapy program

Quality of life indicators	Points	3 months after the physical therapy course (%)		6 months after the physical therapy course (%)	
		MG (n=96)	CG (n=92)	MG (n=96)	CG (n=92)
Mobility	1 point	52,1	38,1	76,1*	65,2
	2 points	25,0	32,6	15,6*	21,7
	3 points	20,8	26,1	8,3*	13,1
	4 points	2,1	3,2	0	0
	5 points	0	0	0	0
Self-care	1 point	51,0	39,2	75,0*	64,2
	2 points	28,1	25,0	16,7*	20,6
	3 points	14,6	29,3	8,3*	15,2
	4 points	6,2	6,5	0	0
	5 points	0	0	0	0
Normal daily activities	1 point	41,7	38,1	70,8*	62,0
	2 points	27,1	23,9	20,8*	26,1
	3 points	25,0	30,4	8,4*	11,9
	4 points	6,2	7,6	0	0
	5 points	0	0	0	0
Pain/discomfort	1 point	43,8	39,2	74,0*	64,1
	2 points	26,0	21,7	17,6*	23,9
	3 points	22,9	31,5	8,4*	12,0
	4 points	7,3	7,6	0	0
	5 points	0	0	0	0
Anxiety/depression	1 point	42,8	32,7	82,3*	70,7
	2 points	26,0	23,9	12,5*	21,7
	3 points	20,8	30,4	5,2*	7,6
	4 points	10,4	13,0	0	0
	5 points	0	0	0	0

* – $p < 0,05$ between the indicators of the main and control groups.

We consider the following to be the features of the developed physical therapy system that determined its high efficiency: a system has been developed for restoring and improving the quality of life of patients with rheumatoid arthritis, which consists of the comprehensive use of rehabilitation measures, taking into account an individual and interdisciplinary approach to each patient in each recovery period. Methodological approaches are taken into account in accordance with the ICF domains, taking into account factors affecting the level of functional impairment and the patient's quality of life. The proposed concept was holistic in nature, based on the targeted use of an integrated psychological, pedagogical and treatment-rehabilitation approach, the physical therapy program was individually selected for each patient, taking into account the functional insufficiency of the joints, the activity of the rheumatoid arthritis process, and the level of quality of life of the patients (Grygus et al., 2020; Nogas et al., 2022; Nogas, 2023).

Conclusions

A scientifically proven and developed system of physical therapy for patients with rheumatoid arthritis was the basis for drawing up individual physical therapy programs taking into account the functional insufficiency of the joints, the activity of the rheumatoid arthritis process, the health status and standard of living of the patients.

The presented results of indicators on the DASH questionnaire indicate positive changes in the functional ability of the arm and hand of patients

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- of the main group to perform daily activities and participation and perform high-quality household activities.
- Accordingly, significantly better results of the Stanford Health Assessment Questionnaire in patients of the main group indicate the effectiveness of the proposed rehabilitation measures.
- Significantly better differences were identified between patients of the main and control groups according to the results of the EuroQol-5D-5L questionnaire, which clearly demonstrates and confirms the effectiveness of the proposed physical therapy system in contrast to the standard rehabilitation treatment system.
- ### Author's contribution
- Conceptualization, N.A. and G.I.; methodology, N.A.; check, G.I.; formal analysis, H.S.; investigation, N.A.; data curation, B.I. and D.V.; writing – rough preparation, N.A.; writing – review and editing, G.I.; supervision, H.S., B.I. and D.V.; project administration, G.I. All authors have read and agreed with the published version of the manuscript.
- ### Conflicts of Interests
- The authors declare no conflict of interest.
- ### Funding
- This article didn't receive financial support from the state, public or commercial organizations.
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