THE ROLE OF KINESIOTHERAPY IN REHABILITATION AFTER INJURIES AND SURGERIES

Abstract. This article demonstrates the role of kinesiotherapy in postoperative recovery, highlighting its effectiveness in pain management, mobility improvement, muscle strengthening, and overall patient rehabilitation. The primary goal of this research was to systematically analyze the impact of individualized kinesiotherapy programs on postoperative patients, assessing the efficacy of various therapeutic exercises and equipment used in the recovery process. The study involved an in-depth examination of kinesiotherapy practices, including a comprehensive analysis of individualized treatment plans, evaluation of the specific equipment used, and assessment of the physiological impacts on patients. The research findings indicate that kinesiotherapy significantly aids in managing postoperative pain, improving mobility, and enhancing muscle strength and coordination. It was also found to effectively reduce edema and swelling, stimulate various body systems, and positively impact social and occupational rehabilitation. Furthermore, the study highlighted the importance of patient education in the recovery process. The practical significance of this research lies in its contribution to enhancing the effectiveness of postoperative recovery protocols through kinesiotherapy.

Keywords: kinesiotherapy, postoperative recovery, pain management, mobility improvement, muscle strengthening, patient rehabilitation

Formulation of the problem. The imperative to maintain the health and work capacity of populations globally necessitates the development of rehabilitation as a vital aspect of healthcare. Today, approximately 70% of the adult population in various countries, including the United States, exhibits a low to below-average level of physical development. Notably, within this demographic, 65-67% are individuals
aged between 16 and 29 years. In the past five years, there has been a 41% increase in the number of young adults aged 18 to 25 years classified into special medical categories based on their health conditions.

This trend underscores the growing concern over youth and young adult health, indicating a potential public health crisis if unaddressed. Moreover, globally, people with disabilities constitute about 10% of the population, with 88% being of working age. This statistic is significant because it highlights the potential workforce impact, underscoring the importance of effective rehabilitation strategies.

The societal costs of temporary loss of work capacity due to injuries or surgeries are substantial. It is estimated that a significant proportion of the working-age population is affected by conditions that necessitate some form of rehabilitation. This situation calls for an expanded implementation and utilization of non-pharmacological treatment methods, alongside traditional medical approaches.

Kinesiotherapy, a therapeutic approach that utilizes movement and exercise, emerges as a pivotal intervention in this context. It offers a non-invasive, accessible, and often cost-effective means of aiding recovery and improving the quality of life for individuals recovering from injuries and surgeries. The increasing relevance of kinesiotherapy in rehabilitation is not just a response to the growing needs but also an acknowledgment of its effectiveness in fostering quicker and more sustainable recovery processes.

As we delve into this topic, we will explore the various dimensions of kinesiotherapy, its methodologies, evidence-based outcomes, and its evolving role in modern healthcare. This exploration is crucial in understanding how kinesiotherapy can be integrated more effectively into rehabilitation programs to enhance recovery rates, reduce healthcare costs, and ultimately contribute to the overall well-being and productivity of individuals and societies at large.

Analysis of recent research and publications. The significance of physiotherapy in the postoperative recovery process of patients cannot be overstated. It forms the foundation of rehabilitation, even in cases of the most intricate injuries. Physiotherapy plays a pivotal role in enabling individuals with paralysis to regain full or partial functionality of their bodies. Whether addressing mental health concerns or issues with the cardiovascular and digestive systems, physiotherapy is a vital component. Kinesiotherapy, although not widely recognized, is a specialized branch of physical therapy. It's worth noting that the majority of scientific research focuses on physiotherapy rehabilitation, while there is relatively less literature dedicated to kinesiotherapy. Although several specific studies on our topic are observed. Let's consider them.

The work by Protasiewicz-Fałdowska, H., Wiśniewska, T., Zaborowska-Sapeta, K., Kowalski, I. M., & Kiebzak, W. [8] explores the impact of specialized kinesiotherapy on spinal functionality post-fenestration surgery. This study is a valuable contribution to the field of postoperative rehabilitation, particularly
focusing on spinal health and recovery. In this research, patients who underwent fenestration surgeries were initially advised to partake in general exercises such as gym workouts and swimming 2–3 times a week, without any specific rehabilitation guidance. However, three months following surgery, these patients reported several physical challenges, including lower extremity weakness, difficulty in descending stairs, numbness in toes, and discomfort in the lumbar-sacral area during prolonged sitting. The study meticulously documents the improvements observed in these patients following a 3-month period of specialist kinesiotherapy. Notably, there was a substantial increase in the range of motion, as indicated by the improved readings of Lasègue's sign. The pain levels, measured using the Numeric Rating Scale (NRS), showed a significant decrease, highlighting the pain-relieving effects of the therapy. Moreover, the finger-to-floor test results demonstrated an enhancement in lower back flexibility and motion. This was evident from the reduced floor distance, suggesting increased ease and reduced discomfort in bending movements.

In pediatric care, kinesiotherapy's impact is profound. Álvarez et al. [2] have shown how it, alongside massage therapy, can positively influence the development of hospitalized preterm infants. This study underscores the therapy's versatility, demonstrating its applicability from the earliest stages of life, aiding in critical developmental processes. In gynecology, it plays a crucial role, particularly in addressing conditions such as obstetric palsy. Alekaki et al. [1] have highlighted its significant role in treating symptoms associated with this condition. This emphasizes kinesiotherapy's ability to provide specialized care in gynecological health, focusing on muscle strength, flexibility, and overall functional recovery.

Kinesiotherapy's application extends beyond these areas into the treatment of various diseases and conditions. For instance, Bismak and Kalmykova [3] explored its influence on the functional condition of the lower limb in tunnel syndrome of the peroneal nerve. Their findings provide insight into how kinesiotherapy can be tailored to specific conditions, improving mobility and reducing symptoms.

The research findings of Burcea et al. [4] underscore the effectiveness of kinesiotherapy by demonstrating that the identification of specific psycho-kinesic operational objectives for each recovery stage plays a crucial role in providing objective feedback. This approach is directly correlated with the assessment of the quality and effectiveness of the recuperative process. Moreover, the study shows that tailoring the content of psycho-kinesic training to the healing capabilities of the individual, in conjunction with the assessment tests for the quality and effectiveness of the respiratory process, results in an improved quality of recovery for the experimental group. Additionally, the incorporation of psychotherapeutic treatment alongside physiokinesitherapy enhances the effectiveness of the recuperative programs, positively impacting joint functional modifications. The research also highlights the significant influence of negative emotional factors such as stress, anxiety, and depression on muscle contraction and vessel constriction, which can
aggravate the overall recovery process. These insights collectively affirm the efficacy of kinesiotherapy in rehabilitation and recovery.

In chronic pain management, such as for back pain and headaches, Golovacheva and Golovacheva [6] have confirmed the positive impact of kinesiotherapy. This highlights its role in providing long-term relief and improving the quality of life for individuals with chronic conditions. The post-operative care, particularly in cases like abdominal liposuction as explored by SNLA et al. [9], shows the therapy's effectiveness in aiding recovery and minimizing complications following surgical procedures.

The purpose of this research is to demonstrate the kinesiotherapeutic directions in postoperative recovery and their significance in rehabilitation. To achieve the objective in the work, it is necessary to:

• investigate practical medical reports confirming the positive effect of kinesiotherapy in postoperative body recovery;
• to explain the essence of kinesiotherapy and its peculiarities.
• to define the specificity of kinesiotherapy in postoperative recovery using various equipment.
• to identify the main positive aspects of kinesiotherapy and its impact in the context of postoperative recovery.

Presenting main material. The effectiveness of kinesiological interventions in post-surgery recovery is grounded in the use of objective measurements and data-driven insights. Kinesiologists utilize advanced assessment tools like motion analysis systems and muscle strength testing to quantitatively assess the patient's progress. These measurements provide a precise and objective understanding of how interventions impact the patient's functional abilities, going beyond subjective perceptions. Regular reassessment allows kinesiologists to adjust and fine-tune rehabilitation plans, ensuring they align with the patient's evolving needs and progress. This meticulous approach not only confirms the effectiveness of kinesiological interventions but also guides the continuous improvement of rehabilitation strategies, ultimately optimizing long-term post-surgery outcomes.

Based on these studies, it can be understood that all actors equally perceive the essence and meaning of kinesiotherapy. Let's generalize this definition.

Kinesiotherapy, also known as therapeutic exercise or physical therapy, is a branch of medical rehabilitation that studies the mechanisms of therapeutic movement on the body with preventive, curative, and rehabilitative purposes. Kinesiotherapy utilizes one of the most evolutionarily advanced biological functions of the human body, which is movement, for the treatment and prevention of various conditions. However, it employs not just any movement but specifically selected, methodically designed, and properly organized movements referred to as physical exercises.
For the development of an effective kinesiotherapy methodology – movement therapy – a deep understanding of the medical-biological and anatomophysiological regularities of the development of a pathological process in various tissue structures of the injured limb at different stages of movement therapy is of great importance. Thus, the achievements of modern biology and physiology, general physiological teachings about motor-visceral reflexes, and the trophic role of neuromuscular movements allow us to consider kinesiotherapy as the most effective means of comprehensive physical rehabilitation of patients with various injuries of the musculoskeletal system.

Kinesiotherapy's adaptability and comprehensive approach make it a vital component in modern healthcare. Whether it's aiding developmental processes in pediatrics, providing specialized care in gynecology, enhancing recovery in sports medicine, managing chronic conditions, or supporting post-operative rehabilitation, its role is undeniably significant across various medical disciplines.

Kinesiotherapy serves as both a preventive measure and a treatment modality. For prevention, simple exercises and routine physical activity, such as daily workouts, can be sufficient. These general exercises are accessible and can be performed by individuals of varying ages and physical conditions to maintain and improve overall health and physical fitness. The focus here is on promoting wellness, enhancing flexibility, strength, and cardiovascular health, thereby reducing the risk of injuries and certain chronic conditions.

In contrast, when it comes to treatment, kinesiotherapy often requires a more structured and intensive approach, typically carried out in a clinical or hospital setting. This involves the use of specialized features and equipment, such as therapeutic exercise machines, resistance bands, balance tools, and other specialized devices designed to target specific areas of the body or particular conditions. Let's outline the specific features of kinesiotherapy in postoperative recovery and then create a table to summarize these features.

- **Individualized approach.** Kinesiotherapy programs are tailored to meet the individual needs of each patient, considering the type of surgery, the patient's physical condition, and their recovery goals [9].
- **Pain management.** Kinesiotherapy can help in managing and reducing postoperative pain through gentle exercises and movements that increase blood flow and reduce muscle stiffness [6].
- **Improving mobility.** Postoperative kinesiotherapy focuses on gradually increasing the range of motion in affected areas to restore mobility and function [3].
- **Strengthening exercises.** These exercises are designed to strengthen muscles weakened by surgery or prolonged inactivity, helping patients regain their strength [4].
- **Balance and coordination.** Kinesiotherapy includes exercises that enhance balance and coordination, which are often affected after surgery [8].
• **Edema reduction.** Techniques in kinesiotherapy can help in reducing swelling and edema in the operated area, speeding up the healing process [2].

• **Patient education.** Educating patients about safe movement techniques, posture, and self-care to prevent injury and facilitate recovery [5].

• **Progress monitoring.** Regular assessments are conducted to monitor the patient's progress and modify the therapy plan as needed [7].

In kinesiotherapy, various specialized equipment and apparatus are employed to facilitate therapeutic exercises and treatments. These can be systematically categorized in Fig.1.

![Fig.1. Postoperative recovery tools used in kinesiotherapy](image-url)

- **Restoration and development equipment.** This category includes devices designed for specific joint and muscle functions restoration and development, like cycle ergometers, treadmills with adjustable inclines, and load settings. It also encompasses devices aiding in rehabilitating occupational and daily living skills, such as hand expanders, pedal devices, walkers, and standing frames.

- **Balance and coordination tools.** These are aimed at restoring body balance and improving movement coordination, including inclined planes, balance boards, support rollers, and hinged sticks. These tools are crucial in rehabilitation programs focusing on balance and coordination, especially after neurological injuries.

- **Strength training devices.** This includes weights such as dumbbells of various masses, medicinal bars, and other resistance tools essential for muscle building, enhancing endurance, and improving overall physical strength in recovery processes.
- **Massage equipment.** Used for massaging different muscle groups including the back, chest, buttocks, feet, and hands. This equipment plays a significant role in relieving muscle tension, improving circulation, and aiding in relaxation and recovery.

- **Movement-easing equipment.** Comprises horizontal and inclined sliding planes, roller carts, and various suspensions that reduce friction during movement. This equipment is designed to facilitate easier movement execution during therapy sessions.

- **Resistance enhancement tools.** For complicating muscular contractions, movements with dampers or instructor-provided resistance can be employed. This resistance can be variably applied during the movement, offering a controlled exercise environment.

- **Mechanotherapy devices.** Includes pendulum and pulley-type machines, devices operating on lever principles combined with inertia during movement, and various therapeutic exercise machines. These are integral to mechanotherapy, providing precise, controlled movements for rehabilitation purposes [5].

Each category plays a crucial role in kinesiotherapy, serving specific therapeutic functions and ensuring effective, safe, and individualized exercises and treatments for enhanced recovery and rehabilitation.

The physiological effects of kinesiotherapy in postoperative recovery are multifaceted and significantly contribute to patient rehabilitation. The following summary outlines the key aspects of how kinesiotherapy aids in this process:

- **Stimulation of the central nervous system (CNS), Proprioception, and Hormonal Regulation.** Physical exercises serve as adequate stimulators of the CNS, proprioception, and hormonal regulation of metabolic processes. This stimulation leads to the formation of movement dominance or dominants of functioning nerve centers, fostering adaptive reactions, compensation, and restructuring of functions, and creating new levels of system functioning [1].

- **Formation of integrated motor reflexes.** During voluntary movements, integrated motor reflexes are formed, encompassing sensory, motor, and vegetative components. The sensory component is facilitated by afferent impulses from muscle spindles, which go to the suprasegmental structures of the brain stem and the motor area of the cerebral cortex. This leads to descending control signals to motoneurons and relevant effectors like skeletal muscles (motor component) and internal organs and vessels (vegetative component) [7].

- **Dynamic motor stereotypes and functional motor systems.** Repeated motor acts lead to the formation of dynamic motor stereotypes, helping in consolidating developing motor skills. This results in a functional motor system that ensures precise adaptation of movements to changing external conditions, achieving the desired outcome [7].
• Therapeutic impact of physical exercises. The therapeutic action of physical exercises is based on their ability to stimulate physiological processes in the body. The impact on patients is mediated through neural and humoral mechanisms, enhancing nervous connections between the functioning muscle system, brain cortex, subcortex, and internal organs. This link is determined by the functional state of the central nervous system and the state of the humoral environment [4].
• Stimulation of various body systems. Physical exercises stimulate different body systems through the release of hormones and biologically active substances like acetylcholine, histamine, cytokines. These substances activate the system of intracellular mediators of chemical substances on cell metabolism and play a significant role in maintaining the body's homeokinesis [1].
• Improvement of cardiovascular and respiratory functions. Physical exercises enhance the tone of the CNS and change the function of internal organs, particularly the circulatory and respiratory systems. The muscle activity stimulates motor-visceral reflexes, acting as a stimulator and regulator of the circulatory system response. Controlled muscle activity helps restore disturbed autonomic functions due to illness [7].
• Social and occupational rehabilitation. Increased work capacity of patients leads to better social and occupational adaptation. The influence of dosed physical exercises opens up reserve capillaries, improves blood supply to muscles and joints, increases oxygen extraction from blood, and intensifies metabolism. This leads to a decrease in hypoxemia and acidosis in affected tissues, restoring acid-base balance, muscle, and vascular tone.

The kinesiotherapeutic approach in postoperative recovery leverages these mechanisms to restore impaired functions, improve the trophic state of tissues and organs, and facilitate the overall rehabilitation process. The use of specialized training equipment enhances these effects, focusing on functional systems of the body and the development of coordination and motor qualities.

Conclusions. Based on the outlined specifics of kinesiotherapy in postoperative recovery, it is evident that this therapeutic approach plays a critical role in enhancing patient rehabilitation. Kinesiotherapy, with its individualized programs, focuses not only on alleviating pain and improving mobility but also on strengthening exercises, balance, coordination, and edema reduction. These components are integral in aiding patients to regain pre-surgery levels of function and strength.

The use of various specialized equipment and apparatus in kinesiotherapy further contributes to its effectiveness. These tools, categorized into restoration and development equipment, balance and coordination tools, strength training devices, massage equipment, movement-easing equipment, resistance enhancement tools, and mechanotherapy devices, serve specific therapeutic functions. They provide safe
and individualized exercises and treatments, thereby ensuring enhanced recovery and rehabilitation.

Physiologically, kinesiotherapy impacts various aspects of recovery, including CNS stimulation, formation of integrated motor reflexes, development of dynamic motor stereotypes, and functional motor systems. The therapeutic impact of physical exercises is mediated through neural and humoral mechanisms, stimulating various body systems, improving cardiovascular and respiratory functions, and aiding in social and occupational rehabilitation.

In conclusion, kinesiotherapy in postoperative recovery is a comprehensive approach that not only addresses physical rehabilitation but also encompasses neurological, psychological, and social aspects of recovery. Its effectiveness is underpinned by a combination of tailored exercises, specialized equipment, and an understanding of the physiological impacts on the body. This holistic approach ensures that patients can achieve the best possible outcomes in their recovery journey, restoring their functionality and quality of life.

References: