7. Lavrent'yev O.M Antonenko S.A. Serhiyenko YU.P. (2025). Formuvannya hotovnosti viys'kovosluzhbovtsiv na zanyattyakh z fizychnoyi pidhotovky do vedennya boyovykh diy [Formation of readiness of military personnel in physical training classes for conducting combat operations]. Naukovyy chasopys Ukrayins'koho derzhavnoho universytetu imeni Mykhayla Drahomanova. 4(190):83-87. https://doi.org/10.31392/UDU-nc.series15.2025.04(190).16

8. Maslyak I.P., Kryvoruchko N.V., Slobodyanyuk YU.V. (2021). Fizychnyy rozvytok zdobuvachiv osvity 1-2 kursiv zakladiv fakhovoyi pered vyshchoyi osvity [Physical development of students in 1st-2nd year of professional pre-higher education institutions]. Naukovyy chasopys NPU imeni M.P. Drahomanova. 11(143):92-95. https://doi.org/10.31392/NPU-nc.series15.2021.11(143).19

9. Romanchuk S.V. Ozharevs'kyy V.A. Pan'kevych YA.A. Kolin'ko I.A. Pylypchak V.V. Meleshenko O.V. Senyk R.M. (2024). Fizychna pidhotovlenist' – yak skladova uspishnoho vykonannya zavdan' za pryznachennyam (na prykladi fakhivtsiv inzhenernykh viys'k) [Physical fitness – as a component of successful performance of assigned tasks (using the example of engineers)]. Naukovyy chasopys Ukrayins'koho derzhavnoho universytetu imeni Mykhayla Drahomanova. 7(180):147-154. https://doi.org/10.31392/UDU-nc.series15.2024.7(180).30

10. Trachuk S. V Pidleteychuk R. V Mil'ko N. R Syrotyuk S. M (2024). Fizychna pidhotovlenist' ta hotovnist' uchnivs'koyi molodi do viys'kovoyi sluzhby [Physical fitness and readiness of students for military service]. Naukovyy chasopys Ukrayins'koho derzhavnoho universytetu imeni Mykhayla Drahomanova. 4(174):159-162. https://doi.org/10.31392/UDU-nc.series15.2024.4(177).33

11. Shlyamar I.L. Vorontsov O.S. (2023). Porivnyannya systemy otsinyuvannya z fizychnoyi pidhotovky v zbroynykh sylakh providnykh krayin NATO [Comparison of physical fitness assessment systems in the armed forces of leading NATO countries]. Naukovyy chasopys NPU imeni M.P. Drahomanova. 10(170):161-168. https://doi.org/10.31392/NPU-nc.series15.2023.10(170).34

12. Artiuh V.V., Kozina Zh.L., Koval V.O., Safronov D.V.,Fomin S.V., Novikov Yu.O. Influence of application of special means of development of equilibrium and precision-target movements on the level and structure of psychophysiological indicators, physical and technical readiness of archers. Health, Sport, Rehabilitation. 2018; 4(4):7–16. https://doi.org/10.34142/HSR.2018.04.04.01

13. Deak G., Kyrychenko V., Horatiu N., Khurtenko O., Zhovtenko Y., Pidhaina V., Boros-Balint I. Clustering undergraduate students enrolled in physical education majors in Romania and Ukraine based on their physical fitness levels. Journal of Physical Education and Sport ® (JPES). 2025;19 (1):167 – 174. https://doi.org/10.7752/jpes.2025.01019 [Romania].

14. Kyrychenko V., Graziela-Flavia D., Horatsiu N., Gombosh L. Features of physical development and physical fitness of students from the Faculty of Physical Education and Sport, Babeș-Bolyai University *Journal of Physical Education and Sport ® (JPES).* 2023;63(2):510–516. https://doi.org/10.7752/jpes.2023.02063

15. *Surajudeen T.B.* Physical Fitness Status of Male, and Female Non-Athlete in Nigeria *Indonesian Journal of Educational Research and Technology.* 2022;2(2):123-132. https://doi.org/10.17509/ijert.v2i2.40982

16. Sermaxhaj S., Arifi F., Iber A., Diellza K., Malsor G., Suela S. The Impact of the Soccer Training Season on the Body Composition and Physical Performances of Young Soccer Players. Sport Mont. 2024;22(1):31–36. https://doi.org/10.26773/smj.240205

DOI: https://doi.org/10.31392/UDU-nc.series15.2026.01(200).49

Soha Serhii
Senior Lecturer at the department of health and sports technologies, National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute"
orcid: 0000-0003-4599-2456
Dobrovolskyi Volodymyr
Senior Lecturer at the department of health and sports technologies, National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute"
orcid: 0000-0001-9598-5153
Zhovtenko Yevhenii
Senior Lecturer at Fitness and Recreation of the National University of Physical Education and Sports of Ukraine Kyiv.
orcid: 0009-0005-4908-0528

ADAPTIVE PHYSICAL CULTURE AFTER MUSCULOSKOLE INJURIES

People with musculoskeletal injuries may not immediately recognize the severity of their injuries. As a result, treatment and recovery from injury becomes a long and complex process, as the problem manifests itself in its advanced stages. Athletes involved in active sports, such as team sports, cross-country skiing, freestyle skiing, and others, are particularly at risk of injury. Intensive participation in these sports can increase the likelihood of serious injuries.

For people who have experienced an injury, adaptive physical education classes become not only a method of rehabilitation but also a means of social and psychological adaptation. These classes help unlock a person's potential, restore self-confidence, actively participate in sports, enhance self-esteem, and teach independence and the ability to overcome psychological barriers. Adaptive physical education promotes balance between restoring social functionality and

self-realization. After an injury, a person needs to learn to act autonomously, relying on the new realities of their body and environment, while maintaining inner harmony. The article examines the importance of adaptive physical education after injuries to the musculoskeletal system, reveals the principles, methods and stages of adaptive physical education, and presents the characteristics of exercises used after various injuries to the musculoskeletal system.

After a musculoskeletal injury, recovery is a complex and lengthy process. The effectiveness of this process depends on many factors, including the severity and nature of the injury and the victim's motivation to restore a normal lifestyle. Adaptive physical education is a specialized area of physical rehabilitation that utilizes various methods and means of physical activity and sports to improve the victim's physical condition and mobility, restoring their health and ability to work.

Adaptive physical therapy is based on physical exercise, which plays a significant role in the recovery process. Muscle activity and movement are powerful stimulants of vital functions and provide the biological basis for these exercises. Physical exercises are typically tailored to each patient's individual needs, taking into account their health status and ongoing treatment. From a wide range of exercises, only those that meet the goals of treatment and prevention are selected.

Key words: *people, injury, recovery, spine, exercises, load.*

Сога Сергій, Добровольський Володимир, Жовтенко Євгеній. Відновлення при травмі опорно-рухового апарату засобами адаптивної фізичної культури. *Люди з травмами опорно-рухового апарату можуть не одразу розпізнати тяжкість своїх травм. В результаті лікування та відновлення після травми стає тривалим і складним процесом, оскільки проблема проявляється на запущених стадіях. Спортсмени, які займаються активними видами спорту, такими як командні види спорту, лижні перегони, фрістайл та інші, особливо ризикують отримати травми. Інтенсивні заняття цими видами спорту можуть збільшити ймовірність серйозних травм.*

Для людей, які пережили травму, заняття адаптивною фізичною культурою стають не лише методом реабілітації, а й засобом соціальної та психологічної адаптації. Ці заняття допомагають розкрити потенціал людини, відновити впевненість у собі, активно брати участь у спорті, підвищити самооцінку, навчати самостійності та вмінню долати психологічні бар'єри. Адаптивна фізична культура сприяє балансу між відновленням соціальної функціональності та самореалізацією. Після травми людині потрібно навчитися діяти автономно, спираючись на нові реалії свого тіла та навколишнього середовища, зберігаючи при цьому внутрішню гармонію. У статті розглядається важливість адаптивної фізичної культури після травм опорно-рухового апарату, розкриваються принципи, методи та етапи адаптивної фізичної культури, а також представлена характеристика вправ, що використовуються після різних травм опорно-рухового апарату.

Після травми опорно-рухового апарату відновлення – це складний і тривалий процес. Ефективність цього процесу залежить від багатьох факторів, включаючи тяжкість і характер травми, а також мотивацію потерпілого до відновлення нормального способу життя. Адаптивне фізичне виховання – це спеціалізована галузь фізичної реабілітації, яка використовує різні методи та засоби фізичної активності та спорту для покращення фізичного стану та рухливості потерпілого, відновлення його здоров'я та працездатності.

Адаптивна фізична терапія базується на фізичних вправах, які відіграють значну роль у процесі відновлення. М'язова активність і рух є потужними стимуляторами життєво важливих функцій і забезпечують біологічну основу для цих вправ. Фізичні вправи зазвичай підбираються відповідно до індивідуальних потреб кожного пацієнта з урахуванням стану його здоров'я та поточного лікування. З широкого спектру вправ вибираються лише ті, що відповідають цілям лікування та профілактики.

Ключові слова: *люди, травма, відновлення, хребет, вправи, навантаження.*

Formulation of the problem. The primary goal of adaptive physical therapy is to maximize the patient's functional capacity. If complete restoration is not possible, partial restoration or compensation for lost functions is essential for improving quality of life. In any case, the primary goal is to slow the progression of the disease and make life as comfortable as possible for the patient.

Analysis of literary sources. This topic has been studied in depth by the following authors: Kurtova G. Yu. Arkhipov O. A, Korop M. Yu., Gamov V. G., Vertel O. V. [1], Mukhin V. M. [2], Obeziuk T.K. [3], Sabirov O., Abramov S. [4].

When selecting exercises, the patient's health and physical capabilities are taken into account. If used correctly, any exercise can be incorporated into adaptive physical therapy. One tool in this process is a movement regimen, which, when properly organized and monitored, can contribute to improving the patient's physical mobility.

The principles of adaptive physical therapy represent the fundamental foundations of the recovery process. It is recommended to include feasible physical therapy exercises in the rehabilitation process from the very beginning of treatment. This approach not only helps prevent possible degenerative changes in tissues but also promotes the best possible recovery after injury or illness [2].

The fundamental principle of adaptive physical therapy is a comprehensive approach, incorporating a variety of methods and types of activities, such as physical exercise, massage, training on specialized equipment, the use of orthopedic devices, occupational therapy, psychotherapy, and autogenic training. Individualization of the rehabilitation program to address the unique needs of each patient is essential. The phased rehabilitation approach allows patients to gradually adapt to new challenges and restore their functional capabilities. Continuity and consistency in rehabilitation procedures ensure sustainable and effective results.

The social focus of the interventions not only involves restoring physical capabilities but also integrating the patient into society, enabling them to actively participate in everyday life. Monitoring the program's workload and effectiveness is an

integral part of the rehabilitation process [1]. By continually analyzing and evaluating the achieved results, the program can be adjusted and optimal recovery ensured.

Adaptive physical therapy should be used cautiously and tailored to the individual needs of each patient. Some exercises can be effective even in acute, postoperative, and severely ill periods, highlighting the need for an individualized approach and specialist supervision.

During recovery from illness, the volume, type, and consistency of physical exercise play a role. In the initial stages of illness, patients often limit their movements to alleviate discomfort and speed recovery. However, as the body begins to recover, it is necessary to gradually increase their range of motion. Patients are allowed to get out of bed, move around the ward and department, and gradually increase their physical activity. A variety of exercises can be included, from hygienic and therapeutic exercises to walks and various work tasks. Determining the right physical activity regimen is often the primary factor in health recovery, surpassing even adaptive procedures, which may depend on the patient's level of physical mobility [4]. As the patient's condition improves, the intensity and variety of exercises should be gradually increased. In a healthcare setting, not only physical therapy should be provided but also encouragement for patients to engage in physical activity. Furthermore, it's essential to teach them how to use these skills at home after discharge to maintain the level of health they've achieved. Therefore, adaptive physical education after injury is essential for restoring health and returning to an active lifestyle. Properly planned and executed exercises promote not only physical but also psychological recovery, helping patients achieve optimal results and improve their quality of life.

Methods and stages of adaptive physical therapy after musculoskeletal injuries. To prevent negative consequences and help patients regain functionality after injury, it is necessary to use adapted physical therapy. Exercises should be individualized and tailored to each patient's needs. Including exercises aimed at strengthening the muscles around the injured area and restoring range of motion in such programs is essential for successful rehabilitation [3]. Other methods, such as physical therapy and massage, can be helpful for improving circulation, relieving pain, and accelerating tissue healing.

Each injury is unique and requires an individualized approach to treatment and rehabilitation. Adaptive physical therapy after injury should be focused on maximizing functional recovery and improving the patient's quality of life. Adaptive physical therapy is a component of an integrated rehabilitation method, ensuring not only the restoration of musculoskeletal function after injury but also beneficially influencing various body systems through the mechanism of motor-visceral reflexes. The adaptive physical therapy program is divided into three main phases: initial, intermediate, and recovery. During the initial phase, which can be called the immobilization phase, the main goal is to stimulate fracture healing and primary bone formation over a period of approximately 60 to 90 days. The goals of adaptive physical therapy at this stage include improving blood circulation to the injured area, accelerating fracture healing, preventing muscle atrophy, and reducing joint mobility. To achieve these goals, a variety of exercises are used, including symmetrical exercises for the healthy limb, ideomotor training, static muscle strengthening exercises, and exercises aimed at maintaining mobility in the injured area [1]. Movement of the uninjured body parts and joints not affected by the injury is important when performing exercises, while static loading of the muscles in the injured area and work with immobilized joints should be performed taking into account the degree of fracture immobilization. When using metal structures to fix fractures or devices such as the Ilizarov apparatus, active muscle contractions and movements in adjacent joints can be enabled at earlier stages of treatment.

The intermediate rehabilitation phase involves gradually increasing the load and intensity of exercises aimed at restoring full functionality to the injured limb or body region. It includes work on improving strength, flexibility, coordination, and endurance, which facilitates the patient's recovery from the injury. During the initial stage of rehabilitation after fractures, light exercises are used, such as exercises on sliding surfaces, to minimize discomfort and prevent worsening of the condition. Massage for diaphyseal fractures with a plaster cast is prescribed after two weeks, starting with the healthy limb and gradually moving to the injured area, beginning above the injury site. With skeletal traction, massage begins after 2-3 days, first on the healthy limb, then on the injured one. Contraindications include purulent processes and thrombophlebitis. In the second period, which begins after the cast or traction is removed, the patient may experience muscle weakness and limited joint motion. Exercises at this stage are aimed at restoring nutrition to the injured area, strengthening muscles, increasing range of motion in the joints, restoring posture, and eliminating temporary compensations [4]. This includes balance training, learning to use crutches, and restoring function to the healthy leg. Exercises are performed in a variety of positions, alternating with relaxation exercises for muscles with increased tone. Massage for muscle weakness or hypertonicity is performed starting above the injury site, and simple gymnastic exercises are alternated with massage.

In the third period of rehabilitation, the goal of adaptive physical therapy is to restore full range of motion in the joints and strengthen the muscles. General developmental gymnastic exercises are applied with greater loads and are supplemented by walking, swimming, water exercises, and mechanotherapy. Thus, adaptive physical therapy after an injury requires careful planning, a systematic and individualized approach, and attention to each patient, which helps them return to a full life and active physical activity. The foundation of adaptive physical therapy for spinal injuries is the consistent introduction of physical exercises. The entire rehabilitation process requires careful monitoring and an individualized approach to each patient, taking into account the nature and extent of the spinal injury. Only such a comprehensive approach can ensure effective recovery and prevent possible complications [1]. Adaptive physical therapy is aimed at strengthening various muscle groups, including the back, abdominal muscles, pelvis, arms, and legs. During the initial period, lasting approximately two months, patients perform side bends and gentle twists, first on their back and then on their stomach. Each session lasts up to 40-45 minutes and is repeated several times a day, with a primary focus on specific exercises to strengthen the core muscles.

After spinal fractures, standing from a prone or kneeling position without bending forward is usually possible 6-12 weeks after the injury. With thoracic fractures, this may occur even earlier. As patients become accustomed to the upright position, walking is added. Sitting is permitted after 3-6 months for 5-10 minutes several times a day. At this time, patients begin performing forward bends. Adaptive physical therapy sessions are continued after discharge from the hospital for a year or more. If the patient is treated with a plaster cast, bed rest is prescribed for 7-15 days. Adaptive physical education begins 2-3 days after the start of wearing the corset, using general strengthening and breathing exercises in a supine position with a light load [4].

These exercises are aimed at stimulating regeneration and developing a muscular corset by strengthening the back and abdominal muscles. They are performed in various positions: supine, prone, or kneeling. After removing the corset, adaptive physical training is continued for a period of time in the same starting positions. Forward bends are introduced cautiously 8-10 weeks after the fracture. With osteosynthesis, physical exercises are prescribed immediately after surgery in the supine or prone position. Standing and standing exercises are permitted from 10-18 days after surgery. Isometric muscle tension is used at the level of injury, and spinal extension is avoided in the first and second periods. For cervical spine injuries, where there is no risk of vertebral displacement, adaptive physical activity is started from the very beginning, which helps maintain muscle tone and reduces the risk of complications. Immediately afterward, specialized measures are applied, such as a cervical brace (Schanz collar), which allows the patient to sit and walk while preventing unnecessary neck movement [2]. The rehabilitation process includes various exercises, starting with those performed in a sitting and standing position and gradually progressing to more intense exercises such as head rotations and tilts. For fractures of the transverse and spinous processes of the vertebrae, the patient is recommended to remain on strict bed rest for 2-4 weeks. For this purpose, a special pad is placed under the mattress, providing a rigid surface and preventing excessive movement, which promotes proper bone fusion. In some cases, additional immobilization using corsets or bandages may be required to support the spine and reduce pain. Traction can be used to relieve pain and reduce pressure on nerve endings, helping to restore the proper alignment of the vertebrae and improve circulation.

For chest injuries, such as rib or sternum fractures, emphasis is placed on specific adaptive physical exercises, which are essential for restoring health and function. In the first days after an injury, breathing exercises begin, gradually moving from diaphragmatic to chest breathing, and teaching coughing techniques correctly, which helps prevent respiratory complications [1].

Gradually, the program includes general strengthening exercises for the limbs, performed in various positions, taking into account the patient's physical capabilities and limitations. This makes it possible not only to restore respiratory function but also to strengthen weakened muscles, increase overall endurance, and return to normal daily activities.

Conclusions.

Musculoskeletal injuries are common and can limit the patient's mobility. Adaptive physical therapy serves as a means of recovery. Its diverse methods are aimed at restoring bodily function, which can improve patients' quality of life. Adaptive physical therapy places particular emphasis on physical exercise, which plays a significant role in the recovery process. Therapeutic gymnastics musculo-sceletal system occupies a leading position among these. Its effectiveness lies in its comprehensive impact on muscles, joints, and ligaments, promoting improved mobility and strength. The use of musculo-sceletal system in adaptive physical therapy allows patients to regain some motor function and increase their independence. Even if full recovery is unattainable, regular exercise helps reduce the severity of disability and improve overall well-being. Thus, musculo-sceletal system is an integral part of adaptive physical therapy, creating the conditions for active recovery and improving the quality of life for people with musculo-sceletal system injuries.

Reference

1.Kurtova G. Yu. Arkhipov O. A, Korop M. Yu., Gamov V. G., Vertel O. V. (2017). Determining the attitude of future physical education teachers to professional activity in an inclusive class. Bulletin of the Chernihiv National Pedagogical University named after T. G. Shevchenko. Issue 147. Volume I. Series: Ped. Sciences. – Chernihiv: 312 - 315 p.

2.Mukhin V. M. (2009). Physical rehabilitation: textbook / V. M. Mukhin - 3rd ed., revised and supplemented. — K.: Olimpiyskaya, literature — 488 p.

3.Obeziuk T.K. (2025). Recommended types of health technologies used for the prevention of various diseases and rehabilitation to restore lost function. Scientific journal of the Mykhailo Dragomanov Ukrainian State University. Series 15, 11 (198), 235-241 p.

4.Sabirov O., Abramov S. (2025). Adaptive physical culture. Its types and features. Scientific journal of the Mykhailo Dragomanov Ukrainian State University. Series 15, 5 (192), 195 p.