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THEORETICAL BASES OF RECOVERY OF ATHLETES AFTER INJURIES AND OPERATIONS

K. I. Kovalyova, I. V. Golovchenko, S. I. Danylchenko*

Kherson State University, Department of Physical Therapy and Occupational Therapy, Kherson, Ukraine

ORCID ID: 0000-0003-2153-2367, e- mail: igolovchenko@ksu.ks.ua
ORCID ID: 0000-0001-5312-0231, e- mail: svetlanaadanilch@gmail.com
***Correspondence:** e- mail: svetlanaadanilch@gmail.com*

Abstract. The purpose of this study was to analyze modern methods and strategies for the restoration of athletes after injuries and operations, as well as to evaluate their effectiveness based on practical research.

Object and research methods. Analysis of scientific literature and modern research in the field of rehabilitation of athletes. Review of medical, physical and innovative methods of recovery of athletes.

Results. According to many researchers, sports competitions are one of the most dangerous in terms of injury to the musculoskeletal system. Sport is leading the number of injuries, mainly due to rapid changes in the movement during the game and the need to make quick and effective decisions in a limited time. In addition to physical training, athletes are subjected to considerable neurological and psychological stress during competitions, accompanied by intense emotional experiences. This is due to, in particular, physical contact, frequent jumps, sprints and sharp turns, which often contribute to the occurrence of sports injuries. Experienced athletes who compete at a high level of more than 10 years are most injured.

The main purpose of the rehabilitation process is to reduce the degree of injury, reduce or restore disorders and functional losses, as well as prevent, correct or completely eliminate disability.

The rehabilitation process is overseen by a multidisciplinary team, which includes a doctor, sports doctors, physical therapists, orthopedists, physiotherapists, rehabilitologists, physical educators, sports coaches, psychologists and nutritionists. The team works with the athlete and the trainer to determine the goals of rehabilitation, evaluate progress and set the time of return to training and competitions.

Proper goals are key to sports rehabilitation, as it can significantly speed up the recovery process after injury. The goals should be clearly defined, measured and formulated in specific behavioral terms. Studies show that goals should be ambitious but achievable. It is important to focus on short -term goals as steps to achieve long -term results.

Psychological recovery involves working on adaptation to changes in physical condition and new training conditions. Athletes need to learn to adapt to new or altered physical abilities and find new strategies to achieve high results. This may include adaptation of exercise technique, changing training strategies, or even developing new sports skills. The psychological component of rehabilitation includes aspects of restoring self -confidence. The gradual achievement of realistic goals, positive reinforcements and achievement of intermediate successes help to restore confidence. The rehabilitation program should include tasks that gradually increase the complexity, allowing the athlete to experience gradual progress.

Improving the quality of the rehabilitation process and, as a consequence, the success of the return of athletes to active sports activities is influenced by reasonable recommendations for the use of various methods of recovery in sports practice used to develop individualized rehabilitation programs.

Conclusions. Successful restoration of athletes after injuries involves a comprehensive approach that covers both physical and psychological aspects. Interaction between physical and psychological components of rehabilitation helps athletes not only to restore their physical form, but also to return to competitions with new confidence and motivation.

Keywords: sports, injuries, rehabilitation, athletes, physical therapy, recovery.

Relevance. In the modern sports world, injuries are an integral part of the careers of many athletes, regardless of the sport or level of training. Injuries can significantly affect sports activities, leading to a decrease in physical performance, changing the athlete's lifestyle and, in the worst case, threatening his career. Therefore, effective recovery from injuries and operations is a critically important aspect that requires an integrated approach and integration of various methods and strategies to achieve optimal results. The relevance of the study is due to the need to develop and implement the latest rehabilitation methods that would contribute to faster and more effective recovery of athletes.

Research on the level of injuries, rehabilitation methods and prevention in modern sports is an extremely relevant topic for modern science. The number of sports injuries is constantly growing. In different countries of the world, the share of injuries in sports is 10–17% of the total

number of injuries [1-4].

In 2007, the National Collegiate Athletic Association (NCAA) published data on 182,000 injuries based on more than 1 million sports reports. The association collects standardized information on injuries sustained during collegiate athletic competitions and practices through the Injury Surveillance System (ISS). Data from that period indicated that the injury rate during competition was statistically significantly higher (13.8 injuries per 1,000 competitions) than during practice (4.0 injuries per 1,000 practices).

50% of all injuries occur in the lower extremities. The most common injury across all sports is ankle sprains, which account for 15% of all injuries, while anterior cruciate ligament injuries have increased significantly to 7%. American football has the highest injury rates: 9.6 injuries per 1000 training sessions and 35.9 injuries per 1000 competitions. In Sweden, sports injuries account for 10% of all injuries. The direct and indirect costs of treating sports injuries have reached significant proportions. For example, in the Netherlands, between 200 and 300 million US dollars are spent annually on the treatment of sports injuries. According to insurance companies, between 4 and 5 billion US dollars are spent annually on the treatment of injured skiers in Switzerland [3, 4].

In modern sports, there is an increase in injuries, which is associated with high physical exertion, the desire to achieve high results and the desire to increase one's attractiveness to sports teams [3-5]. Sports injuries account for 10 to 17% of all injuries [4, 5, 6, 7]. Due to occupational diseases and injuries, athletes are forced to miss 7 to 45% of training sessions and 5 to 35% of competitions [1, 8]. About 10% of injured athletes require inpatient treatment, and surgery is necessary in 5–10% of cases [2]. According to the International Olympic Committee, during the 2012 Olympic Games in London, almost every tenth athlete was injured. Representatives of 92 teams reported 1055 injuries. Of these, more than 55% were lower limb injuries, and about 9.5% of athletes suffered head injuries. All injured athletes required a complex of rehabilitation measures [4].

A significant part of injuries (54%) occurs during official matches. The most affected are experienced athletes who have been playing at a high level for over 10 years. This is explained by two main factors: first, the high level of skill and authority of such players leads to the fact that opponents defend themselves harshly, sometimes violating the rules; second, the presence of old injuries makes these athletes more vulnerable.

The causes of sports injuries are divided into direct and indirect [5, 6, 9].

Direct causes include organizational factors (unsatisfactory material and technical support of the training process, sanitary and hygienic conditions, the level of training of the coach, competition schedule, quality of refereeing, meteorological conditions); and methodological factors (lack of medical control, lack of warm-up, forcing physical activity, improperly selected groups of athletes, violation of the principle of gradualness).

Indirect causes depend on the individual characteristics of the athlete, such as weak physical training, insufficient moral and volitional stability, low level of technical and tactical training, psycho-emotional instability, poor health.

Direct and indirect causes of sports injuries are associated with such factors as too intense a start to training without proper warm-up - which caused 27% of fractures, excessive total load during one training session - 10%, a sharp increase in the length of segments for high-intensity running - 8%, and the use of large volumes of cross-country running without proper preparation - 6% [6, 9].

Most injuries are associated with errors in the organization of the training process. Coaching errors in training methods are the cause of injuries in 30–60% of cases. These errors include insufficient or incorrect warm-up, underestimation of systematic work on technique, regular use of excessive loads, forcing training, lack of or incorrect use of insurance, as well as insufficient restoration of the functional state of athletes. Stimulants pose a particular danger in terms of increasing the level of sports injuries. Nervous system stimulants, such as phenamine derivatives (analogous to the hormones adrenaline and noradrenaline), improve sports performance by eliminating protective inhibition. However, their use can have serious consequences for the health of athletes. The use of phenamine derivatives is known to have led to several deaths, especially in cycling. Deaths due to cardiac dysfunction due to cocaine use have also been reported [4].

Excessive use of anabolic steroids, which is common in many sports, can lead to changes in connective tissue metabolism, weakening of tendons and ligaments, and an increased risk of their rupture. This is confirmed by numerous cases of spontaneous ruptures in athletes involved in speed and power sports.

Structural and functional changes in bone tissue caused by excessive use of anabolic drugs reduce the ability of bones to withstand muscle loads. In young athletes who take such drugs, the growth process of epiphyseal cartilage may also be disrupted.

The use of anabolic steroids can negatively affect the mental state, in particular, reduce control over behavioral reactions and cause aggression and impulsivity. This increases the risk of injury for both the athlete himself and his opponents in sports games or martial arts. Anabolic steroids also increase the risk of cardiovascular disease and liver failure, including liver failure.

Beta-blockers, which are used to reduce anxiety, tremors, and heart rate, can have side effects. They can contribute to depression, sleep disturbances, and sexual dysfunction. By reducing anxiety, beta-blockers increase the risk of injury in complex coordination sports such as gymnastics, alpine skiing, freestyle skiing, and others [10].

Narcotic analgesics, which reduce pain and fatigue, can also increase the risk of injury. Diuretics, which are used to rapidly reduce body weight or eliminate traces of banned drugs, can cause serious side effects, such as electrolyte imbalances, decreased body resistance, which increases the likelihood of injury, and can negatively affect strength, endurance, and coordination.

Corticosteroids, which are often used to reduce symptoms of fatigue, simultaneously disrupt the repair process of tendons, ligaments and cartilage. Within a few months after injections, these structures are at high risk of rupture, and the joints can develop osteoarthritis.

Depletion of muscle glycogen stores due to intense and prolonged training can significantly increase the risk of muscle injuries. This occurs because of the disruption of optimal recruitment of motor units, which leads to the activation of those that are not normally involved in performing certain movements. Such a change in the structure of movements can become an additional risk factor.

During prolonged aerobic loads that are not compensated by appropriate diets, part of the energy begins to come from protein sources, which can lead to a decrease in muscle mass due to protein catabolism and increase the risk of injuries. Iron deficiency reduces the efficiency of oxidative metabolism, which leads to the accumulation of lactate and increases the likelihood of musculoskeletal injuries. Vitamin deficiencies can cause fatigue, slow recovery, and increase the risk of injury.

Vitamin and mineral requirements increase in proportion to metabolic activity, although it was previously thought that these requirements increase more rapidly than metabolism during exercise [11].

Female athletes, especially during the period of intense puberty, may experience serious health problems due to the low-energy diets often used in sports, especially rhythmic gymnastics. Inappropriate weight loss can lead to bone demineralization and menstrual irregularities.

High-level female athletes may experience menstrual irregularities and decreased plasma estrogen levels during intense training, as well as increased cortisol levels. This may increase the likelihood of muscle injuries by 2-3 times compared to athletes with regular menstrual cycles. In addition, such disorders can increase the risk of bone demineralization and stress fractures.

Muscle imbalance, manifested in disproportionate development of muscle analogues, as well as insufficient elasticity of muscles and ligaments, significantly increase the risk of injuries. A variety of muscle training, including stretching and relaxation exercises during warm-up, especially before intensive training, can reduce the number of injuries to muscle, bone and connective tissue by 2-3 times.

A serious threat to the health of athletes are health abnormalities that are not detected during medical control. An analysis of 29 cases of sudden death among high-class athletes showed that 78% of them had serious problems with the cardiovascular system. In particular, 96% of cases (28 out of 29) were associated with structural abnormalities: 18 cases of hypertrophic myopathy, 5 – coronary artery anomalies, 3 – coronary artery disease, 2 – aneurysms [5].

The purpose of this study was to analyze modern methods and strategies for the rehabilitation of athletes after injuries and operations, as well as to assess their effectiveness based on practical research.

Object and methods of the study. Analysis of scientific literature and modern research in the field of rehabilitation of athletes. Review of medical, physical and innovative methods of rehabilitation of athletes.

The scientific novelty of the work lies in the integrated approach to the analysis and comparison of various methods of rehabilitation of athletes. The study includes the latest innovative methods, such as cryotherapy, laser therapy and PRP therapy, and also evaluates their impact in the context of modern medical and psychological approaches. The results obtained will allow to clarify the effectiveness of existing methods and develop recommendations for improving the recovery process.

Research results. The process of recovery of an athlete after an injury is closely related to personal motivation and the importance that the athlete attaches to his recovery. An effective and scientifically based rehabilitation program helps athletes overcome the consequences of an injury and return to training faster. Rehabilitation should begin as early as possible after injury and continue in conjunction with other therapeutic interventions. It may begin before or immediately after surgery if the injury requires surgery.

The rehabilitation plan should address the athlete's goal of returning to the same activity and environment in which the injury occurred. After rehabilitation, functional capacity should be the same or better than before the injury.

The primary goal of the rehabilitation process is to reduce the severity of the injury, reduce or restore impairment and functional loss, and prevent, correct, or eliminate disability [12].

The rehabilitation process is overseen by a multidisciplinary team that includes a physician, sports physicians, physical therapists, orthopedists, physiotherapists, rehabilitation specialists, physical educators, athletic trainers, psychologists, and dietitians. The team works with the athlete and coach to define rehabilitation goals, assess progress, and establish a timeframe for return to training and competition.

Effective rehabilitation of an athlete after an injury depends on several key principles. Here are seven basic principles of rehabilitation:

1. Avoiding exacerbation. During rehabilitation, it is important to avoid worsening the injury. Incorrectly performed exercises or thoughtlessly increasing the load can aggravate the injury.

2. Timing. Starting physical therapy early is critical, but it should only be started when it is safe and does not cause exacerbation. Early exercise will help return to activity more quickly. While rest is necessary, excessive rest can be detrimental to recovery. Athletes should rest the injured body part but continue to train other parts of the body—often referred to as "relative rest."

3. Awareness. The success of a rehabilitation program depends on the patient's informed consent. It is important to explain the program and expected outcomes to the patient. The athlete's participation in goal setting and decision-making promotes motivation and increases the effectiveness of rehabilitation.

4. Individualization. Responses to injury and rehabilitation may vary from person to person. Although injuries may be similar, individual physiological and chemical differences may affect the recovery process.

5. Specific Sequence. A rehabilitation exercise program should be organized in a specific sequence that matches the body's physiological responses to recovery.

6. Intensity. The intensity of the exercise should be sufficient to stimulate recovery but not to aggravate the injury. The patient's response should be closely monitored and the intensity adjusted as the healing process progresses.

7. General Health and Rehabilitation. It is important to support the entire body, not just the injured area. Cardiovascular function, range of motion, strength, and coordination of the uninjured body parts should be maintained. The rehabilitation program should target the entire body to better prepare the patient for a full recovery [13].

These principles will help provide a comprehensive approach to rehabilitation, promoting both the athlete's physical and psychological recovery.

Regardless of the nature of the injury, there are several key components that should be included in effective rehabilitation programs:

1. Therapeutic modalities. Although their role may be minor, therapeutic modalities are important in relieving pain and swelling, allowing for continued rehabilitation through exercise. Massage is an important part of therapy, helping to reduce pain, control swelling, improve function, and promote recovery. It involves soft tissue manipulation to address problems and imbalances caused by injuries or stress.

2. Flexibility. After an injury, flexibility is often reduced due to muscle spasms, inflammation, swelling, and pain. It is important to include flexibility training in a rehabilitation program to minimize decreased joint mobility. Various stretching techniques, including ballistic and static stretching, can be used to improve range of motion.

3. Strength and endurance. Musculoskeletal injuries can lead to skeletal muscle weakness, reduced aerobic capacity, and fatigue. To maintain cardiovascular endurance, it is important to include exercises that increase cardiovascular endurance. Regular exercise such as cycling, pool exercises, or circuit training with weights can be effective.

4. Proprioception. Restoring proprioceptive skills is an important part of rehabilitation. Treatment should be tailored to each individual case, taking into account the type of injury and the specific stress to which the athlete is exposed in their sport [14].

The athlete's psychological readiness for the demands of their sport is also an important part of rehabilitation. Sports injuries can seriously affect an athlete's career and success, even leading to career termination and a reduced quality of life. The initial emotional response to injury is often shock, which can range from mild to significant depending on the severity of the injury. Denial itself can be an adaptive response that helps to cope with extreme emotions in stressful situations. Therefore, rehabilitation and recovery are not only physical, but also psychological processes [15].

A multidisciplinary team should work to create an individual rehabilitation program that addresses all the problems that arise due to impaired body functions after injury. Understanding the injury and the role of each team member is critical to ensuring an effective and successful return to training and athletic performance.

The psychological aspects of athlete recovery are key to a successful return to sport after injury. Athletes often face emotional difficulties, such as fear of re-injury, self-doubt, and stress from a long period without active training.

The emotional response to injury can range from shock to significant stress, which can affect the overall recovery process. Adaptive responses such as denial can help athletes cope with extreme emotional stress, but it is important that these responses do not interfere with progress in rehabilitation. Psychological support can be provided through consultations with psychologists or sports psychologists, who help athletes cope with anxiety and motivational difficulties [16].

The psychological aspects of athlete recovery encompass several key elements that help ensure an effective rehabilitation process. One such element is stress and anxiety management. Athletes often experience significant stress related to the experience of injury, uncertainty about the future, and the possibility of re-injury. It is important to use stress management techniques such as relaxation, meditation, and breathing exercises to help athletes reduce anxiety and maintain composure.

Social support from family, friends, coaches, and teammates can greatly facilitate the recovery process. Social support provides moral support, positive motivation, and a sense of belonging, which can help the athlete cope with psychological difficulties. Communication with teammates and coaches also helps create a positive environment that supports recovery [17].

It is important to incorporate psychological preparation into the recovery process. Psychological preparation helps athletes prepare for their return to competition, determine their attitude toward future challenges, and focus on the positive aspects of recovery. Psychologists can help athletes develop strategies to manage stress, increase motivation, and maintain mental health throughout the rehabilitation process [18].

Conclusions. Successful recovery of athletes from injuries requires a comprehensive approach that encompasses both physical and psychological aspects. The interaction between the physical and psychological components of rehabilitation helps athletes not only regain their physical fitness, but also return to competition with new confidence and motivation.

The practical significance of the study results lies in the creation of sound recommendations for the application of various recovery methods in sports practice. They can be used to develop individualized rehabilitation programs that will contribute to faster and more effective recovery of athletes, as well as to improve approaches to psychological support.

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ТЕОРЕТИЧНІ ОСНОВИ ВІДНОВЛЕННЯ СПОРТСМЕНІВ ПІСЛЯ ТРАВМ ТА ОПЕРАЦІЙ

К. І. Ковальова, І. В. Головченко, С. І. Данильченко*

Херсонський державний університет, кафедра фізичної терапії та ерготерапії, м. Херсон, Україна

ORCID ID: 0000-0003-2153-2367, e- mail: igolovchenko@ksu.ks.ua
ORCID ID: 0000-0001-5312-0231, e- mail: svetlanaadanilch@gmail.com
***Кореспондуючі автори:** e- mail: svetlanaadanilch@gmail.com*

Резюме. Метою нашого дослідження став аналіз сучасних методів та стратегій відновлення спортсменів після травм та операцій, а також оцінка їх ефективності на основі практичних досліджень.

Об'єкт та методи дослідження. Аналіз наукової літератури та сучасних досліджень у сфері реабілітації спортсменів. Огляд медичних, фізичних та інноваційних методів відновлення спортсменів.

Результати. На думку багатьох дослідників, спортивні змагання є одними з найнебезпечніших щодо травмування опорно-рухового апарату. Спорт лідирує за кількістю травм, здебільшого через швидкі зміни рухів під час гри та необхідність ухвалювати швидкі й ефективні рішення в умовах обмеженого часу. Окрім фізичної підготовки, спортсмени під час змагань піддаються значним неврологічним та психологічним навантаженням, що супроводжуються інтенсивними емоційними переживаннями. Це зумовлено, зокрема, фізичним контактом, частими стрибками, спринтами та різкими поворотами, які часто сприяють виникненню спортивних травм. Найбільше травм отримують досвідчені спортсмени, які змагаються на високому професійному рівні понад 10 років.

Основна мета реабілітаційного процесу — зменшити ступінь травми, скоротити або відновити порушення та функціональні втрати, а також запобігти, виправити або повністю усунути інвалідність.

Процес реабілітації курує мультидисциплінарна команда, до складу якої входять лікар, спортивні лікарі, фізичні терапевти, ортопеди, фізіотерапевти, реабілітологи, фізичні педагоги, спортивні тренери, психологи і дієтологи. Команда, яка працює разом зі спортсменом і тренером, визначає цілі реабілітації, оцінює прогрес і встановлює терміни повернення до тренувань та змагань.

Правильна постановка цілей є ключовою для спортивної реабілітації, оскільки може суттєво прискорити процес відновлення після травми. Цілі повинні бути чітко визначеними, вимірюваними та сформульованими в конкретних поведінкових термінах. Дослідження показують, що цілі повинні бути амбіційними, але досяжними. Важливо орієнтуватися на короткострокові цілі як кроки до досягнення довгострокових результатів.

Психологічне відновлення включає роботу над адаптацією до змін у фізичному стані і нових умовах тренувань. Спортсменам потрібно навчитися адаптуватися до нових або змінених фізичних можливостей і знайти нові стратегії для досягнення високих результатів. Це може включати адаптацію техніки виконання вправ, зміну тренувальних стратегій або навіть освоєння нових спортивних навичок. Психологічний компонент реабілітації включає аспекти відновлення впевненості в собі. Поступове досягнення реалістичних цілей, позитивні підкріплення та досягнення проміжних успіхів допомагають відновити впевненість. У реабілітаційній програмі мають бути завдання, які поступово підвищують складність, дозволяючи спортсмену відчувати поступовий прогрес.

На поліпшення якості реабілітаційного процесу і, як наслідок, на успішність повернення спортсменів до активної спортивної діяльності, впливають обґрунтовані рекомендації щодо застосування різних методів відновлення у спортивній практиці, які використовуються для розробки індивідуалізованих реабілітаційних програм.

Висновки. Успішне відновлення спортсменів після травм передбачає комплексний підхід, який охоплює як фізичні, так і психологічні аспекти. Взаємодія між фізичними і психологічними компонентами реабілітації допомагає спортсменам не тільки відновити свою фізичну форму, але і повернутися до змагань з новою впевненістю і мотивацією.

Ключові слова: спорт, травматизм, реабілітація, спортсмени, фізична терапія, реабілітаційна програма, відновлення.

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