

Physiotherapy and Pharmacological approach in sports injury recovery - An integrative review

¹Chayanika Das, ²Chayanika Kalita

¹Assistant Professor Department of Physiotherapy, ²Assistant Professor Department of Pharmacology

¹Physiotherapy Department,

¹Girijananda Chowdhury University, Azara, Guwahati, India

²NETES Institute of Pharmaceutical Science, Mirza, Guwahati, India

Abstract—Sports-related musculoskeletal injuries are common among athletes and often result in pain, functional limitations, and prolonged absence from sporting activities. Effective rehabilitation is essential to ensure optimal recovery, prevent recurrence, and facilitate a safe return to play. This review examines the combined role of physiotherapy and pharmacological interventions in sports injury recovery. Evidence from peer-reviewed literature published between 2012 and 2025 was analyzed using databases such as PubMed, Scopus, ScienceDirect, and Google Scholar. Physiotherapy interventions including therapeutic exercise, progressive loading, manual therapy, neuromuscular training, and a biopsychosocial approach play a central role in restoring strength, mobility, proprioception, and functional performance. Pharmacological treatments, particularly analgesics and non-steroidal anti-inflammatory drugs, are effective in the early management of pain and inflammation but require cautious and time-limited use due to potential effects on tissue healing. The review highlights that an integrated, phase-based approach combining pharmacological management with structured physiotherapy leads to improved clinical outcomes, faster recovery, and reduced risk of re-injury. A multidisciplinary, evidence-informed strategy is recommended to optimize rehabilitation and long-term athletic performance.

Index Terms—Sports injury, Physiotherapy, Pharmacological management, Rehabilitation, NSAIDs, Return to play

INTRODUCTION

Sports – related musculoskeletal injuries are common among athletes of all abilities and present significant challenges to performance, longevity, and health (1,2). If not appropriately treated, these injuries which can range from sprains to tendon, ligament, and joint pathologies, often cause loss of function and extended absences from sports (3). Following such injuries, rehabilitation is essential for both regaining physical capacity and ensuring a safe and effective return to play while preventing recurrence (4).

The foundation of recovery process is Physical Therapy (PT). It aims to restore strength, mobility, neuromuscular control, and ideal movement mechanics, going beyond symptom relief (5). Following an injury, rest and immobilization were traditionally prioritized, however new research is beginning to support the idea of “optimal loading” i.e. early controlled movement to encourage tissue repair and functional recovery (6).

Clinical outcomes further substantiate the significance of physical therapy in the recovery from sports related injuries. A recent observational study involving 216 athletes receiving physical therapy for sport related orthopedic injuries indicated that 86.11 % experienced pain reduction, 80.09 % showed improved range of motion, and 63.89 % successfully resumed sporting activities after a minimum of four weeks of rehabilitation (7). Pharmacology is the study of drugs and their effects on body functions that helps the physiotherapists to understand the efficacy of drugs in physical performance, rehabilitation and therapeutic outcomes. It helps the physiotherapists to plan for a safer and effective treatment sessions for their patients. Both physio and drug therapy together provides better results. Drug shows various side effects which could also be overcome by physio therapy approaches. Both physio and pharmacological treatments are closely connected with each other to restore normal function, reduce pain and improve quality of life. Among athletes and physically active persons, sports injury is becoming very common leading to loss of time, reduced performances and long-term disability. Pain and inflammation are the most common consequences to occur during acute sports injury. Delay of therapies and treatments may lead to chronic problems. Use of anti-inflammatory and analgesic drugs plays an important role in early management of injury and reducing symptoms (8).

AIM OF THE REVIEW

The aim of this review is to summarize the evidence from pharmacological and physiotherapy interventions in the treatment of sports injuries and to show that combining the two methods maximizes healing.

METHODS OF REVIEW

Searches were included for peer-reviewed literature from the year 2012 to 2025. Certain keywords used for the search in the databases PubMed, Scopus, ScienceDirect, and Google Scholar include “sports injury,” “physiotherapy,” “pharmacology,” “NSAIDs,” and “rehabilitation.” It also includes systemic reviews, randomized controlled trials, review articles, and clinical guidelines related to musculoskeletal sports injuries.

COMPONENTS OF PHYSICAL THERAPY IN SPORTS INJURY RECOVERY

THERAPEUTIC EXERCISE AND LOADING

Exercise Therapy underpins the practice of physiotherapy in managing sporting injuries. It involves flexibility, strength, endurance and neuromuscular re-education.

Gradual loading of the injured tissue optimizes healing and avoids deconditioning. Early mobilization avoids stiffness and induces alignment of collagen (5,6). Controlled exercise programs improve joint stability, optimizes muscle function, and ensures recovery of functional movement patterns for return to sport.

MANUAL THERAPY AND SOFT – TISSUES TECHNIQUE

Manual therapy interventions like joint mobilization, myofascial release, and deep tissue massage decrease pain, increase tissue extensibility, and restore joint mechanics. The techniques increase blood flow and neuromuscular feedback allowing quicker recovery (9).

NEUROMUSCULAR CONTROL, PROPRIOCEPTION, AND BALANCE TRAINING

Injury will result in compromised proprioception and movement control. Physiotherapists utilize proprioceptive training (example – single – leg stance, wobble board, perturbation exercises) to re-establish stability and coordination. Neuromuscular re – education enhances joint position sense, diminishes re – injury risk, and prepares the athlete for sport specific movement (10).

INTEGRATION OF BIOPSYCHOSOCIAL FACTORS

The importance of a biopsychosocial approach to sports injuries has increased because it helps clinicians identify physical, psychological, and social barriers that may prevent recovery (11)

EVIDENCE SUPPORTING PHYSIOTHERAPY IN SPORTS INJURY RECOVERY

Evidence consistently confirms the contribution of Physiotherapy in recovery improvement and recurrence prevention. Pain improvement and 80.09% of improvement in ROM were seen in 86.11 % athletes who underwent structured PT programs (7). Manual therapy has been effective in enhancing ROM and pain modulation in musculoskeletal rehabilitation (9). In addition, early intervention with physiotherapy after concussion injury minimizes recovery time and enables accelerated return to play (13). Incorporating technology, including wearable sensors and tele – rehabilitation systems, improves compliance and objective monitoring of athlete development (8).

CLINICAL IMPLICATIONS

Physiotherapists should adopt an athlete-focused, evidence-informed and tailored approach to rehabilitation. Functional goals, and not merely the alleviation of symptoms, should be the primary focus of rehabilitation (1,3). Rehabilitation should be paced by monitoring pain, progressive loading, and continuous assessment (5,6). Stability and coordination, two determinants of re-injury avoidance, are restored by integrating neuromuscular control, proprioception training, and movement quality assessment (9,10). As the risk of poor adherence and anxiety to re-injury may delay return to sport, it is especially important to include incentive approaches and psychological readiness (4,13). A multidisciplinary approach involving psychologists, strength coaches, sports physicians, and physiotherapists enhances recovery outcomes and ensures holistic care. In conclusion, to preserve performance and lower the risk of recurrence, physiotherapists should teach athletes load control, maintenance exercises, and injury prevention warm ups (12)

ROLE OF PHARMACOLOGICAL TREATMENT IN MANAGEMENT OF SPORTS INJURY

Sports injury is very common among the athlete and physically active individuals. Many treatments have been employed for treating acute and chronic injury as well. Researchers have combined both physiotherapy and pharmacology to get better results during either a minor or major injury. Most common drugs used in sports injury are paracetamol, acetaminophen, ibuprofen and naproxen that reduces the pain and inflammation. Paracetamol is frequently the first choice for mild to moderate pain, according to the WHO Pain Ladder. It is safe at doses up to 3g per day and has relatively little negative effects when compared to placebo. According to studies, paracetamol works nearly as well as NSAIDs for pain management after acute sports injuries. Combining paracetamol with NSAIDs on the other hand, may provide better pain relief. NSAIDs are extensively used and well supported by studies for lowering pain and inflammation in athletic injuries(14). Pharmacological management of sports injuries targets multiple well-defined molecular mechanisms of acute inflammatory-repair cascade and pain signaling. Non-steroidal anti-inflammatory drugs (NSAIDs), the most commonly used class, inhibit cyclooxygenase enzymes (COX-1/COX-2), sharply lowering prostaglandin E₂ (PGE₂) production, which reduces vasodilation, edema, and peripheral nociceptor sensitization and thus pain. However, reducing prostaglandin levels can slow down the natural healing signals needed for bone and tendon repair and studies have shown that long-term or selective COX inhibition may delay the recovery process(15). Many anti-inflammatory medicines work through similar molecular pathways in the body, such as MAPK, NF-κB, MMP regulation, and prostaglandin synthesis. These pathways help control pain and inflammation but also play important roles in tissue repair. The effect of these drugs depends on how much is taken, when it is given, and for how long it is used. If used properly, they can reduce pain and swelling while allowing tissues to heal normally. However, using them for a long time or in high doses may give quick pain relief but can slow down or weaken the natural healing process of muscles, bones, or tendons. Because of this, doctors and sports medicine experts now focus on using anti-inflammatory drugs in a more targeted and time-limited way, giving them only when truly needed to relieve symptoms while still supporting proper tissue recovery (16)

INTEGRATED APPROACH TO SPORTS – INJURY RECOVERY

Optimal recovery requires a graduated, integrated approach:

Acute Phase: NSAIDs and short – term analgesics aid early mobilization.

Subacute Phase: Progressive loading based on physiotherapy takes precedence.

Functional Phase: Neuromuscular training and sport specific retraining guide safe return to sport.

Research has shown that the management of patients with medication and physical therapy alone can enable better functional outcomes and quicker recovery with reduced risk of reinjury (8,10,14).

LIMITED AND FUTURE DIRECTIONS

In spite of the widely documented benefits of physical therapy, comparability of research is constrained by differences in treatment strategies and the lack of standardized outcome measures. Future research should focus on:

1. Development of rehabilitative protocols specific to a particular sport.
2. Wearable technology and machine learning are integrated to monitor progress.
3. Long term follow-up for the prevention of re-injuries.
4. Standardized return to play decision making criteria.

CONCLUSIONS

Physical rehabilitation is vital in sports injury recovery due to the use of progressive loading, early mobilization, and tailored rehabilitation methods. Physiotherapy has been determined to enhance performance, speed up healing and reduce the likelihood of re – injury. Rehabilitation outcomes may be even further enhanced through the incorporation of technological innovation and biopsychosocial understanding. To optimize rehabilitation and ensure a safe return to sport, research and standardization of physiotherapy interventions, in conjunction with appropriate pharmacological management, are required.

REFERENCES

- [1] Gabbett TJ. The training–injury prevention paradox: should athletes be training smarter and harder? *Br J Sports Med.* 2016;50(5):273–80.
- [2] 2. Drew MK, Finch CF. The relationship between training load and injury, illness and soreness: a systematic and literature review. *Sports Med.* 2016;46(6):861–83.
- [3] 3. Brukner P, Khan K. Brukner & Khan’s *Clinical Sports Medicine*. 5th ed. New York: McGraw-Hill Education; 2017.
- [4] Rajasekhar S. Optimizing recovery after sports injuries: a multidisciplinary approach to physical therapy in athletes. *Int J Emerg Res Eng Technol.* 2024;5(1):1–7.
- [5] Reinking MF. Current concepts in the treatment of tendinopathy. *Int J Sports Phys Ther.* 2016;11(6):854–66.
- [6] Bleakley CM, Glasgow P, MacAuley DC. PRICE needs updating, should we call the POLICE? *Br J Sports Med.* 2012;46(4):220–1.
- [7] Ullah S, Zafar MA, Saleem K, et al. Analyzing the role of physical therapy in recovery from sport-related orthopedic injuries. *Cureus.* 2025;17(7): e88613.
- [8] de Sire A, Marotta N, Lippi L, Scaturro D, Farì G, Liccardi A, et al. Pharmacological Treatment for Acute Traumatic Musculoskeletal Pain in Athletes. *Medicina (Kaunas).* 2021 Nov;57(11).
- [9] Wei Y. Effect of manual therapy on musculoskeletal injury rehabilitation: pain modulation and range of motion restoration. *Acad J Med Health Sci.* 2023;4(7):96–101.
- [10] Rajasekhar S. Optimizing recovery after sports injuries: a multidisciplinary approach to physical therapy in athletes. *Int J Emerg Res Eng Technol.* 2024;5(1):1–7.
- [11] Li X, Zhang H, Wang Y, Xu J. Biopsychosocial approach to sports injury: a systematic review and exploration of knowledge structure. *BMC Sports Sci Med Rehabil.* 2024;16(1):115.
- [12] Yadav SK, Singh A, Antiwal M, et al. Efficacy of sports rehabilitation programs in accelerating return to play after injury: a systematic review. *Afr J Biomed Res.* 2024;27(3S):4609–18.
- [13] Art K, Ridenour C, Durbin S, Bauer M, Hassen-Miller A. The effectiveness of physical therapy interventions for athletes post-concussion: a systematic review. *Int J Sports Phys Ther.* 2023;18(1):26–38.
- [14] Leyk D, Rütther T, Hartmann N, Vits E, Staudt M, Hoffmann MA. Analgesic Use in Sports. *Dtsch Arztebl Int.* 2023Mar;120(10):155–61.
- [15] Duchman KR, Lemmex DB, Patel SH, Ledbetter L, Garrigues GE, Riboh JC. The Effect of Non-Steroidal Anti-Inflammatory Drugs on Tendon-to-Bone Healing: A Systematic Review with Subgroup Meta-Analysis. *Iowa Orthop J.* 2019;39(1):107–19.
- [16] Ohashi N, Kohno T. Analgesic Effect of Acetaminophen: A Review of Known and Novel Mechanisms of Action. 2020;11(November):1–6.