



Rethinking ACL Rehabilitation: From Time-Based Recovery to Performance-Driven Return to Sport

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Editorial

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Abstract

Anterior cruciate ligament (ACL) injury continues to challenge physiotherapists despite substantial advances in surgical techniques, rehabilitation protocols, and sports medicine research. The field has undoubtedly progressed from prolonged immobilisation to early mobilisation and structured exercise-based rehabilitation. Yet one uncomfortable reality remains: many individuals never regain their pre-injury level of performance, and reinjury rates, particularly among young athletes returning to pivoting sports, remain unacceptably high. This disconnect suggests that current rehabilitation paradigms may have reached a plateau. Traditional milestone-based approaches, heavily dependent on postoperative timelines, often fail to account for individual biological healing, psychological readiness, movement quality, and sport-specific demands. Emerging technologies, including wearable sensors, objective strength assessment, biomechanical analysis, and patient-reported outcome measures, provide an opportunity to redefine successful rehabilitation. Equally important is recognising ACL rehabilitation as a long-term process rather than a short episode ending with return-to-sport clearance. This editorial argues that physiotherapy must move beyond protocol-driven rehabilitation toward personalised, criterion-based care integrating physical, psychological, and functional recovery. Such a shift represents not merely an improvement in clinical practice but a necessary evolution to optimise patient outcomes and reduce the growing burden of recurrent ACL injuries.

Keywords: Anterior Cruciate Ligament; Rehabilitation; Return to Sport; Physiotherapy; Sports Medicine; Injury Prevention

Introduction

The greatest failure in ACL rehabilitation is not that patients struggle during recovery it is that many appear successful when discharged while remaining inadequately prepared for the demands awaiting them. A patient who walks without pain, demonstrates acceptable knee range of motion, and completes standard strengthening exercises may still possess deficits that only emerge during cutting, landing, deceleration, or competitive sport. Clearance based primarily on elapsed time after surgery has become one of the most persistent weaknesses in contemporary rehabilitation.

ACL reconstruction has become increasingly sophisticated, yet surgery alone cannot restore athletic performance. Physiotherapists occupy the pivotal position in determining whether an athlete merely returns to participation or truly returns to previous performance without avoidable reinjury. The growing body of rehabilitation research has shifted attention away from the graft itself toward neuromuscular control, movement quality, strength symmetry, psychological readiness, and long-term knee health. The challenge facing the profession is no longer discovering whether rehabilitation matters it is redefining what successful rehabilitation should look like.

Beyond Healing the Ligament: Rehabilitation Must Restore the Athlete

For decades, rehabilitation protocols largely revolved around biological healing timelines. While tissue healing remains fundamental, biological recovery does not necessarily correspond with functional readiness. Two patients reaching the same postoperative milestone may possess markedly different capacities to tolerate sport-specific loads.

Contemporary rehabilitation increasingly recognises quadriceps strength as a cornerstone of successful recovery. Persistent quadriceps weakness has been associated with altered biomechanics, reduced functional performance, and diminished patient outcomes long after surgery. Yet strength alone cannot explain why reinjury remains common among young athletes.

Movement quality deserves equal attention. Dynamic knee valgus, poor trunk control, asymmetrical landing mechanics, and impaired neuromuscular coordination often persist despite acceptable clinical examination findings. These deficits rarely become apparent during isolated strength testing but emerge under the complex demands of sporting activity.

Equally significant is the psychological dimension of rehabilitation. Fear of reinjury, lack of confidence, and hesitation during high-demand movement frequently limit performance despite satisfactory physical recovery. Instruments such as the ACL-Return to Sport after Injury (ACL-RSI) scale acknowledge that psychological readiness is not a secondary consideration but an integral component of rehabilitation. Ignoring these factors risks discharging physically capable patients who remain mentally unprepared.

The physiotherapy profession should resist viewing rehabilitation as a sequence of exercises. Instead, it should be recognised as a process of restoring the entire movement system, where muscular strength, motor control, cognitive confidence, and sport-specific adaptability interact continuously.

The Problem with Time-Based Rehabilitation

Perhaps the most entrenched habit in ACL rehabilitation is the reliance on predetermined timelines. Questions from athletes often begin with, "When can I run?" or "When can I return to football?" Unfortunately, clinicians sometimes answer these questions with calendar dates rather than objective evidence.

Recent international recommendations increasingly

advocate criterion-based progression rather than fixed postoperative schedules. Functional testing, hop performance, strength assessment, movement analysis, and patient-reported outcomes provide far richer information than time alone. Nevertheless, implementation remains inconsistent across clinical settings.

Part of the problem lies within healthcare systems themselves. Limited access to specialised rehabilitation, financial constraints, and pressure for rapid return frequently shorten rehabilitation programmes before optimal recovery is achieved. Many patients discontinue supervised physiotherapy once daily activities become manageable, despite evidence suggesting that deficits often persist well beyond the first postoperative year.

Another overlooked issue is the diversity of ACL populations. The rehabilitation needs of an elite football player differ fundamentally from those of a recreational runner or an older adult seeking functional independence. Uniform protocols cannot adequately address such varied expectations. Personalised rehabilitation should become the standard rather than the exception.

Technology may assist this transition. Wearable motion sensors, force plates, handheld dynamometry, and digital rehabilitation platforms now allow objective monitoring outside specialised laboratories. These tools should not replace clinical reasoning, but they can strengthen decision-making by providing measurable indicators of progress. Their increasing accessibility presents an opportunity to democratise high-quality rehabilitation rather than restrict it to elite sports environments.

The Next Decade Demands a New Definition of Success

The profession must reconsider how rehabilitation success is measured. Too often, success is defined simply by return to sport. This endpoint is insufficient.

True success should include sustained participation, reduced reinjury risk, restoration of movement quality, long-term joint health, patient confidence, and preservation of physical activity across the lifespan. Osteoarthritis remains a significant long-term consequence following ACL injury, regardless of reconstruction status. Rehabilitation strategies that focus solely on short-term performance ignore this broader responsibility.

Future research should prioritise implementation science alongside clinical efficacy. Many effective rehabilitation principles already exist, yet widespread adoption remains inconsistent. Understanding why clinicians struggle to

implement evidence-based assessment may ultimately prove more valuable than developing another rehabilitation protocol.

Education also deserves renewed emphasis. Physiotherapists require ongoing training in biomechanics, load management, psychological assessment, and objective performance testing. Multidisciplinary collaboration involving surgeons, sports physicians, strength and conditioning specialists, psychologists, and physiotherapists should become routine rather than exceptional.

Most importantly, patients must become active partners in rehabilitation. Shared decision-making encourages realistic expectations while improving long-term adherence. Rehabilitation should empower individuals to understand their recovery rather than simply complete prescribed exercises.

Conclusion

ACL rehabilitation stands at an important crossroads.

The profession has accumulated substantial scientific knowledge, yet clinical practice has not consistently translated that evidence into better long-term outcomes. Continuing to rely predominantly on postoperative timelines risks producing patients who appear recovered but remain vulnerable.

Physiotherapists should champion a more ambitious model of rehabilitation one centred on objective performance, individual progression, psychological readiness, and lifelong joint health. Return to sport should no longer represent the finish line; it should mark the beginning of sustained performance supported by continued monitoring and injury prevention.

The future of ACL rehabilitation will not be defined by increasingly complex surgical procedures. It will be determined by whether rehabilitation evolves from protocol-driven care to truly personalised, evidence-informed practice. That transformation should become a collective priority for clinicians, researchers, educators, and healthcare systems alike.

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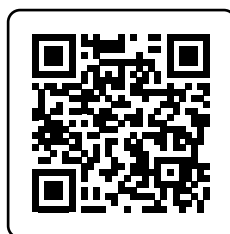
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